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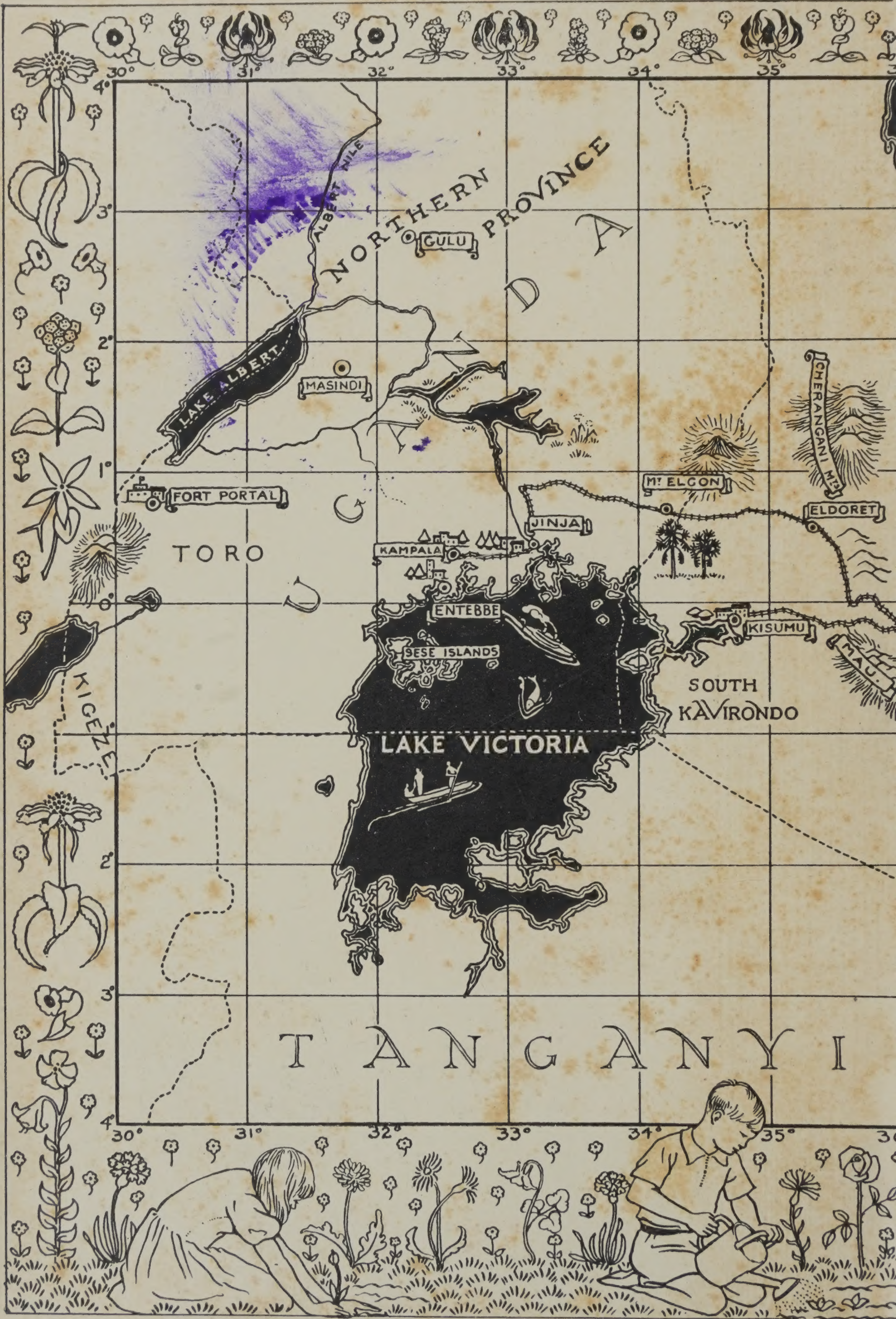
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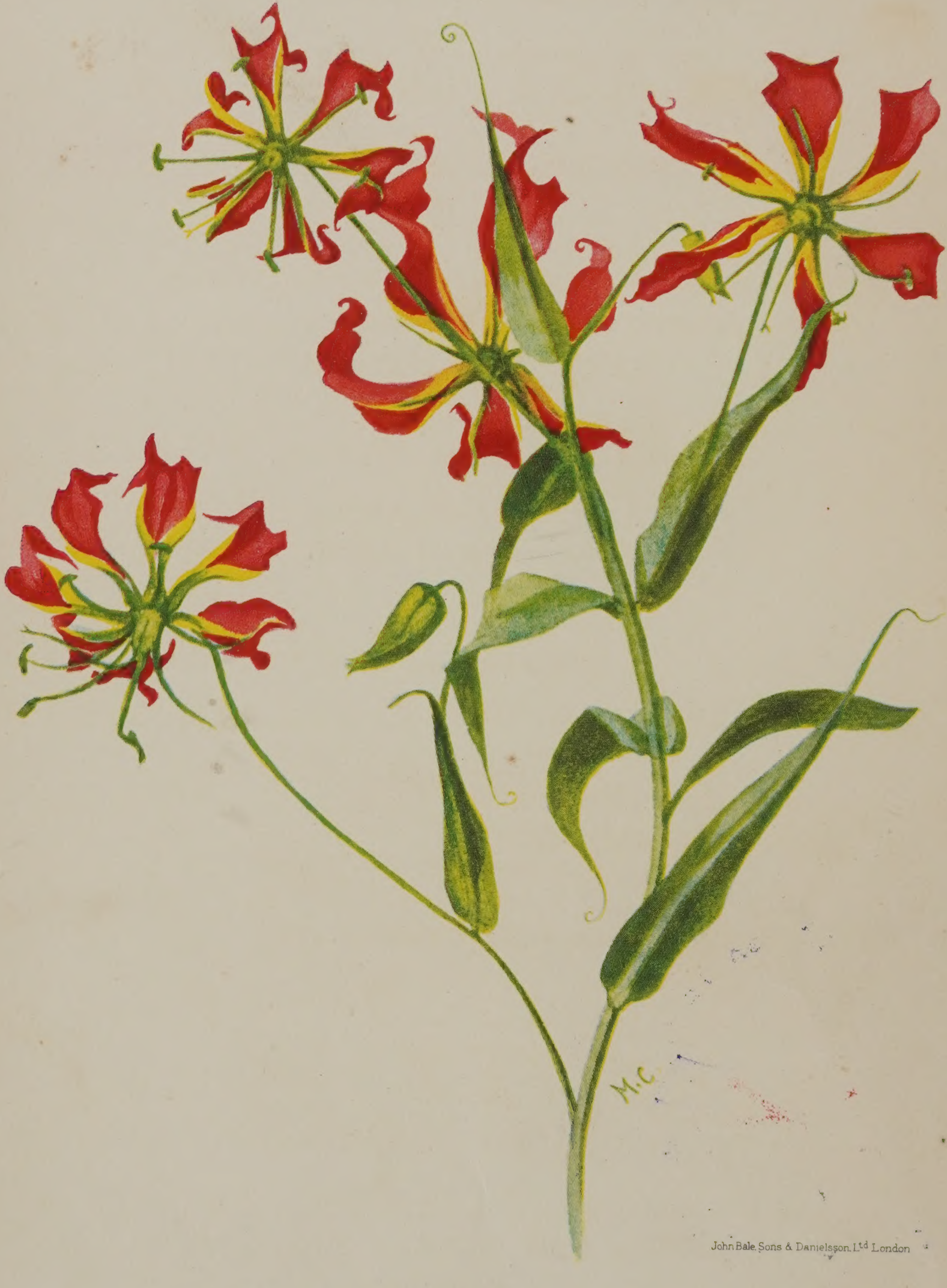

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GLORIOSA VIRESCENS

See page 123.

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GARDENING IN EAST AFRICA

A PRACTICAL HANDBOOK

by

MEMBERS OF THE KENYA HORTICULTURAL
SOCIETY AND OF THE KENYA AND
UGANDA CIVIL SERVICES

Edited by

A. J. JEX-BLAKE
M.D. (Oxon.), F.R.C.P. (Lond.)

With a Foreword by

SIR ARTHUR W. HILL, K.C.M.G., F.R.S.
DIRECTOR OF THE ROYAL BOTANIC GARDENS

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FOREWORD

'As is the Garden such is the Gardener.'—*Hebrew Proverb.*

THE love of gardening, so truly one of 'the Purest of Humane pleasures' and so great a 'Refreshment to the Spirits of Man,' is characteristic of British folk wherever they may be found. It certainly conduces to their well-being and happiness, and it may be that the lessons learnt from gardens are of value in their dealings with their fellow-men of whatever race they may be.

The keenness and enterprise of British settlers in East Africa in the direction of Horticulture has long been the admiration of gardeners and botanists at home, so that 'Gardening in East Africa,' the various chapters of which have been written by distinguished members of the Kenya Horticultural Society and of the Kenya and Uganda Civil Services, under the editorship of Dr. A. J. Jex-Blake, is a particularly welcome volume.

The editor and the authors are to be congratulated on having produced an admirable volume of great practical value, which is not only a very fitting tribute to the laudable achievements of the keen amateur gardeners in East Africa, but also a mine of valuable information to all who may be striving to make the most of their opportunities in these colonies.

It will naturally be a book of great value to those going out to Kenya, teaching them beforehand what to do and what to avoid: while to gardeners at home, who may be anxious—as so many fortunately are—to help their horticultural friends in distant parts of the Empire, it will be most useful, for the book is so well written and so comprehensive, that much of it is applicable to other parts of the tropical and subtropical colonies and dominions.

The Apostle might well have been addressing the amateur gardeners at Corinth instead of the Christians, some of whom doubtless were gardeners, when he extolled the virtues of Faith, Hope and Love (including Charity), since without these three, and especially Love, no one can really be a gardener. The gardeners in East Africa, as is shown by this book, offer striking examples that they follow St. Paul's precepts : since without unbounded faith, constant hope, and deep love for their plants, they would never have persevered as they have done and faced so cheerfully the ravages of drought, insect and fungus pests, and the other ills not met with at home.

Then, again, charity in the sharing of their plants and their experiences with friends and neighbours is one of the essential qualifications of anyone carrying on the time-honoured profession of Adam, if only for the 'sound investment' reason that if one loses a good plant one may find it again in the garden of a friend to whom one had sent it.

Not only are these African gardeners successfully attempting to grow every plant 'pleasant to the sight and good for food,' but by their labours of love they are, we may hope, helping to cultivate that tree whose leaves will be 'for the healing of the nations.'

An important feature of the book is the attention that has been paid to the many fine indigenous trees and shrubs and to the herbaceous and bulbous plants of East Africa. Only too often overseas one finds the beautiful and interesting native plants wholly neglected—sometimes, alas, in Botanic Gardens!—while for sentimental reasons efforts are concentrated on flowers which remind the gardener of his native home. Again, as at home, many gardeners, as Mr. Grahame Bell points out, 'find more pleasure in succeeding with a comparatively indifferent plant, that is out of its element, than in growing many of the most gorgeous flowers when they require neither thought nor care.' This, of course, is the real gardening spirit, since it entails careful experiments and concentrated effort, and the various writers have provided the keen cultivator not only with the fullest help in solving his problems, but ample information as to the plants most suitable for his attention.

It is perhaps a little invidious to draw particular attention to some of the chapters when all are so good, but I cannot help referring to the three admirable opening chapters dealing with the climate, and on soil and manurial questions; all matters of the highest importance which are too often treated with scant attention in works on Horticulture.

Nor can I omit to refer to Mr. Sharpe's delightfully humorous and most practical account of 'Gardens at the Coast,' a result due, I feel sure, to his early training in Horticulture at Kew and elsewhere, which should encourage all living by the coast to try and make their seeming desert 'rejoice and blossom as the rose.' Then, again, Lady Muriel Jex-Blake, to whom gardeners in Kenya owe so great a debt and whose remarkable collection of plants I have had the good fortune to see, is to be congratulated on having contributed so ably from the wealth of her experience, and thanked for the timely warnings she has given as to what to plant and what to avoid, and with regard to climbing plants where they should or should not be planted.

Finally, I would commend highly the chapters on fruit and vegetable cultivation. As in the other chapters the cultural instructions are simple, concise and very much to the point, that dealing with vegetable culture, so essential a matter for human welfare, being a model of thoroughness.

With all good things there is apt to be an unpleasant side, and this is only too often the experience of gardeners. The sting comes appropriately in the tail of the book in the two chapters on Insect Pests and Fungus Diseases! East Africa has its full share of these troubles, but with the advice given by Mr. Anderson and Mr. McDonald from their rich experience, the gardener is now well armed to fight the enemies which array their legions before his gates.

The Kenya Horticultural Society by producing this excellent book under the editorship of Dr. Jex-Blake has enabled gardeners present and future to achieve Abraham Cowley's desire, which he expressed in a letter to John Evelyn :

'I never had any other desire so strong, and so like to covetousness, as that one which I have had always, that I might be master at last of a small house and large garden, with very moderate conveniences joined to them, and there dedicate the remainder of my life only to the culture of them and study of nature,

> And there (with no design beyond my wall) whole
> and entire to lie,
> In no unactive ease, and no unglorious poverty.'

ARTHUR W. HILL.

ROYAL BOTANIC GARDENS,
KEW.
June 1934.

PREFACE

THE climate of many portions of East Africa—Kenya, Uganda, and Tanganyika Territory—is particularly favourable to the gardener, and its special conditions are in some ways unlike those of other parts of the world. There has long been a demand in Kenya for a practical book dealing with gardening in the Colony, and years ago the Secretary of the Royal Horticultural Society urged that one should be written; accordingly the members of the Kenya Horticultural Society, which has had an active and flourishing existence since the year 1922, have taken the matter up—and this volume is the result. Most of its chapters have been written by gardeners who are settlers in the Colony; and for the more technical and scientific portions the Society owes its best thanks to various members of the Government Service: the names of the contributors will be found in the Table of Contents on a later page.

The object of the writers has been to produce a practical book for the amateur gardener, with details of what he should do with his garden, how and why he should do it, and what sorts of flowers, fruits, and vegetables he may best grow there. With few exceptions only such plants as have already been proved and found to do well are here described. Gardening in East Africa is still in its childhood, and offers plenty of scope for further experiments in horticulture; the more so because every sort of climate is to be found at one altitude or another within its boundaries, and because in almost any Kenya garden varieties of shrubs and flowers normally regarded as tropical, subtropical, and hardy may be found flourishing together side by side. It is believed that the volume will also be found useful to gardeners in other tropical and subtropical parts of the world ; and that it will serve as a lure to people keen on gardening who are proposing to settle in East Africa, where all one's plants commonly blossom twice a year—and in wet years thrice in the twelve months—and there need be no season when the garden is destitute of flowers.

Completeness can hardly be hoped for in a gardening book, and for the doubtless many errors of omission about this one the editor alone is responsible. It will be found, too, that the advice given on single points in the care or cultivation of plants is not always the same in different chapters. When these inconsistencies are detected the reader is begged to remember Kipling's well-known axiom that

'There are nine and sixty ways of constructing tribal lays,
And every single one of them is right!'

All roads lead to Rome, it is said, and that very different methods of cultivation should so often agree in giving the same excellent results is one of the most attractive features of the gardener's work. And, now that the subject of work has been mentioned, the opportunity occurs to recommend our amateur gardeners to do as much of their garden work as they can with their own hands. Native garden-boys in East Africa, taken by and large, are unskilled labour, and not too competent—how could it be otherwise in so new a country ? To stand by and direct their work in the garden is not enough, nor is it enough to teach them their job and leave them to carry on, if good work is to be done. Every garden will, of course, have its disasters—the unaccountable failure of seeds to come up, the unexplained death of seedlings planted out, the rooting-up of all the flowers when the bed is weeded, and so on—but if the gardener is not too proud to do a job of work himself these disasters will be few, and the triumphs both many and personal.

Not a few owners of gardens are content to grow familiar flowering plants and fruits and grow them well. Others, more adventurous, have the ambition to grow things new and rare, and this cannot be done unless one has some of the bigger standard books on gardening to guide one's choice and let one know what plants there are in the wide world to choose from. For gardeners in East Africa the best and most useful of these are, without doubt, the two following :

'Johnson's Gardeners' Dictionary.' London : Routledge & Co., 1918. Price 15*s*. net.

'Tropical Gardening and Planting.' By H. F. Macmillan. Third Edition. Colombo & London, 1925. Price 37*s*. 6*d*.

Both of these are invaluable as books of reference. To those who want to know more about the indigenous trees and woody plants of Kenya Colony, E. Battiscombe's illustrated 'Descriptive Catalogue,' published by the Crown Agents for the Colonies (London, 1926, price 10*s*.), may be particularly recommended. A fuller account of tropical and subtropical fruits than is given in Macmillan's book above will be found in

'A Manual of Tropical and Subtropical Fruits.' By W. Popenoe. New York : Macmillan & Co., 1927. Price 20*s*. net.

Should gardening questions and knotty points about plants or their pests arise that cannot be answered out of books, the gardener in Kenya can commonly learn what he wants by applying to one or other of the many experts in either the Forest Department, or the Scott Laboratories that form a part of the Kenya Department of Agriculture, where the latest information is to be had for the asking.

In conclusion, and on behalf of the Committee of the Kenya Horticultural Society and himself, the editor begs to express to all those who have helped in the composition of this book the thanks due to them : to Sir Arthur Hill for his Foreword and the interest he has taken in the work ; to Miss M. Collyer, Miss E. Napier and Mr. R. L. Nestor, for the coloured plates, and to the Committee of the East Africa and Uganda Natural History Society for permission to make use of those painted by Miss Napier ; to Mrs. G. V. Anderson for the map of East Africa adorning the end-papers ; to all those who have written its various chapters (not forgetting the author of the article on Grapes who prefers to remain anonymous) ; to Mr. B. L. Burtt of Kew Gardens for his help in correcting the manuscript ; and, last but not least, to Mr. H. J. Galt of the Kenya Forest Department, who has put his sound knowledge of horticulture so often and so freely at the editor's disposal.

THE EDITOR.

NAIROBI,
June 1934.

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GARDENING IN EAST AFRICA

CHAPTER I

THE CLIMATE OF EAST AFRICA FROM THE GARDENING POINT OF VIEW

The determining factors of climate from the gardening point of view in East Africa are clearly temperature and rainfall, and in this respect, if sufficient rainfall is available most parts of East Africa enjoy a continuous growing season.

In so far as temperature is concerned, there cannot be said to exist a regular succession of spring, summer, autumn and winter. The seasons are dependent on the advent of the rains—the absence of rains is the only reason for cessation of growth, provided the plants are suitably selected.

The controlling temperature variation in the highlands is the diurnal change. The seasonal change of the mean daily temperature is very slight, but the diurnal change is excessive on all days which are characterised by an absence of cloud.

Most plants which grow between fixed mean temperature limits are affected by the accumulated temperature, or the number of degree-hours during which they are exposed to temperatures above a critical value; but it would appear that the short period exposure to the high temperatures of the daytime or the low temperatures of night make it possible for the climate in the highlands to accommodate a very wide range of plant life, from the tropical to the high latitude temperate species.

Very little real experimental work associated with scientific observations of climatic factors has so far been undertaken. It appears probable that, with a better understanding of the effect of this marked diurnal variation on plant life, conditions could be so modified in regard to exposure to high sun temperatures during the day and low radiation temperatures during the night that a considerable improvement could be effected in the produce of the gardens of Kenya and the highlands of East Africa generally.

Another effect of the diurnal change is the abnormal exposure to varying humidity conditions. These vary during the clear days and nights of the periods intermediate between the rain seasons from saturation, or 100 per cent., in the early morning hours to, at times, a relative humidity of 12 per cent. in the afternoon. The effect on the soil of this exposure to intense drying conditions must undoubtedly be considerable, and suggests that the study of the effect of mulches might have a marked influence on plant life from the point of view of both soil moisture and soil temperatures.

The conditions described above appear to be the main controlling factors of plant life in the highlands, and it seems probable that a more intelligent study of their effects and influences, together with experimental work on the possibility of their modification, would greatly improve the produce of East African gardens both in quality and quantity. While the selection of correct types is clearly a desideratum, it is not possible to determine from any *a priori* considerations how any plant, from either the tropical or temperate zones, will respond to the short period variations which occur from midday to midnight on an almost constant mean temperature curve.

The British East African Meteorological Service is of such recent formation that complete records are not available for all the varied climates of Kenya, but sufficient work has been done in the three years of its existence to exemplify much of what has been written in the preceding paragraphs. The records which will be considered in this article have been secured principally at the two extreme points of the

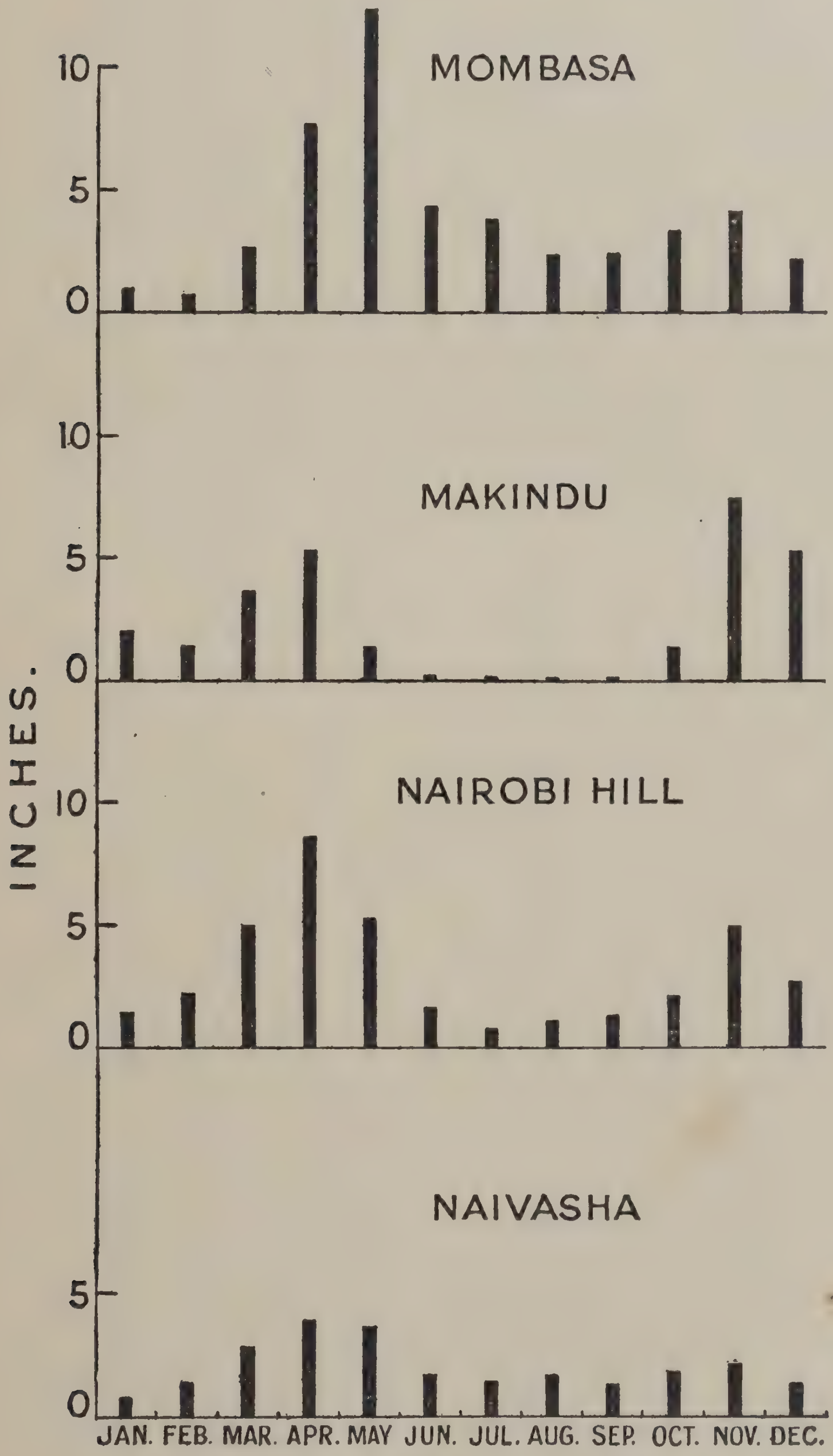

Fig. 1.—Seasonal Rainfalls in Kenya.

Similar graphs for stations in Tanganyika, Uganda and Northern Rhodesia are shown in Fig. 2.

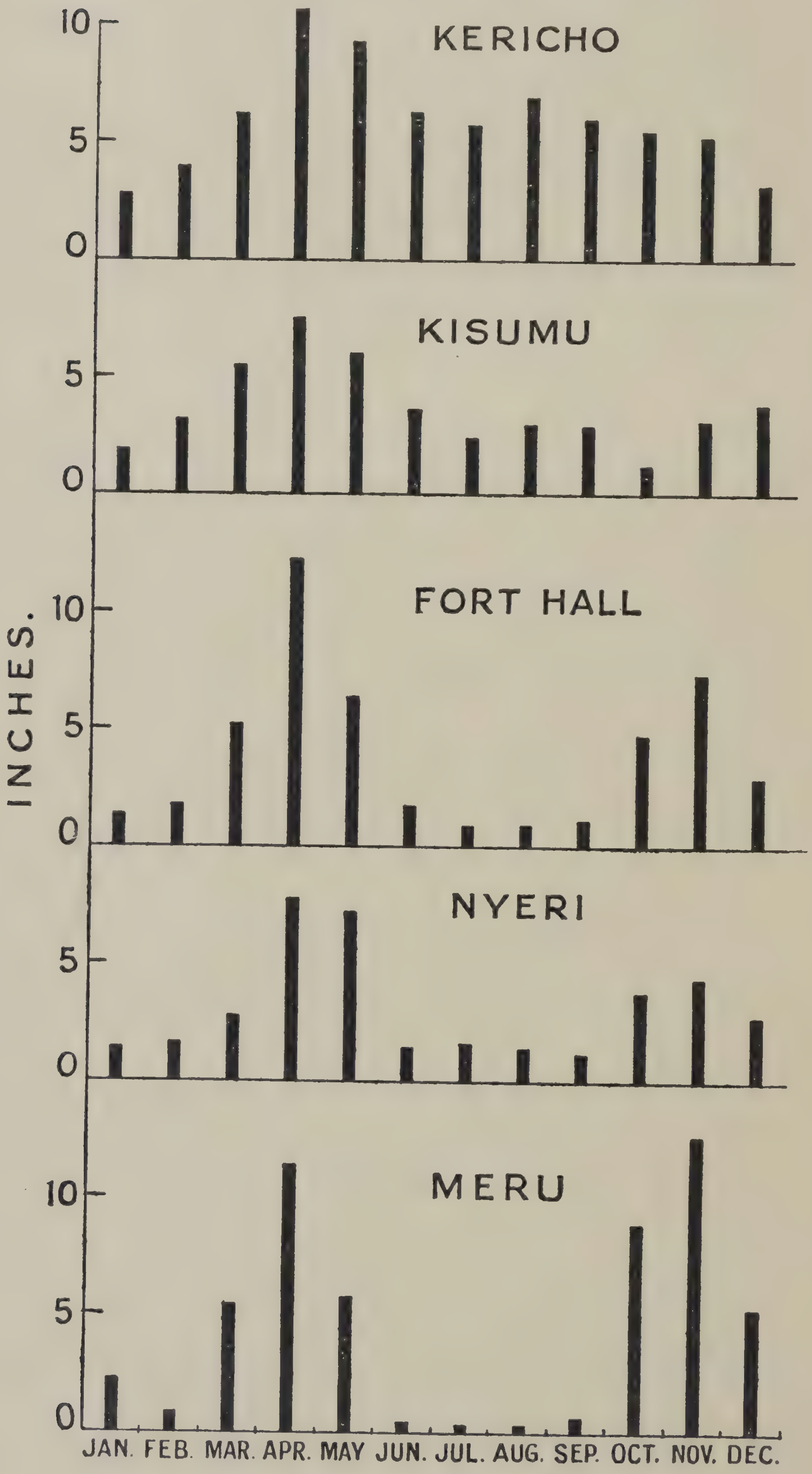

Fig. 1.—*continued.*

Colony—Mombasa at sea-level and Nairobi at an altitude of 6,000 ft. The study of these results should be made in the light of the general conditions described above.

Rainfall. Over the greater part of the highlands there are two main rain seasons : the long rains, which normally commence late in March and continue to the end of June, and the short rains in October-December.

Between these two main seasons the grass rains, as they are called, relieve the drought during the period January to March, and the monsoonal rains of July-August help to tide over the similar conditions which obtain between June and October.

In the lake areas round Kisumu the rains are practically continuous in the form of afternoon showers and thunderstorms.

The seasonal rainfall is shown on the accompanying graphs (Fig. 1) for the different zonal conditions from the Coast to the Great Lake, for the following nine stations in Kenya :—

1. Mombasa.
2. Makindu.
3. Nairobi Hill.
4. Naivasha.
5. Kericho.
6. Kisumu.
7. Fort Hall.
8. Nyeri.
9. Meru.

The continued denudation of forest growth all over Africa, which is a feature of the wasteful husbandry of native races, has resulted in heavy erosion and destroyed the even flow of most rivers and streams. These become torrents in the heavy rains and dry up completely between the rain seasons. This denudation has clearly gone on for ages past. In order fully to appreciate the differing methods of European and native agriculture, it is only necessary to traverse Africa by air. Wherever European settlement has occurred, avenues and forests of trees grow

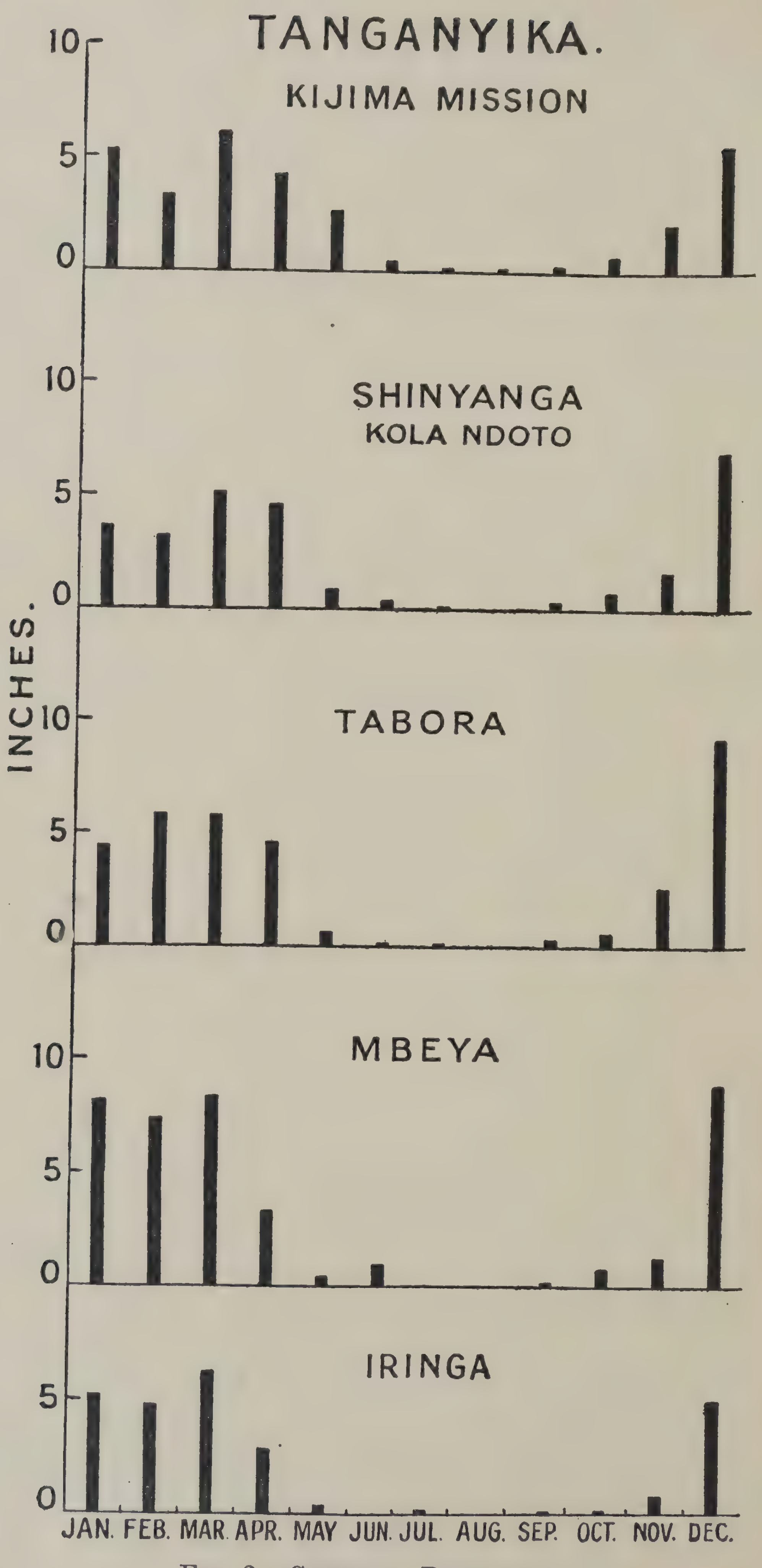

Fig. 2.—Seasonal Rainfalls.

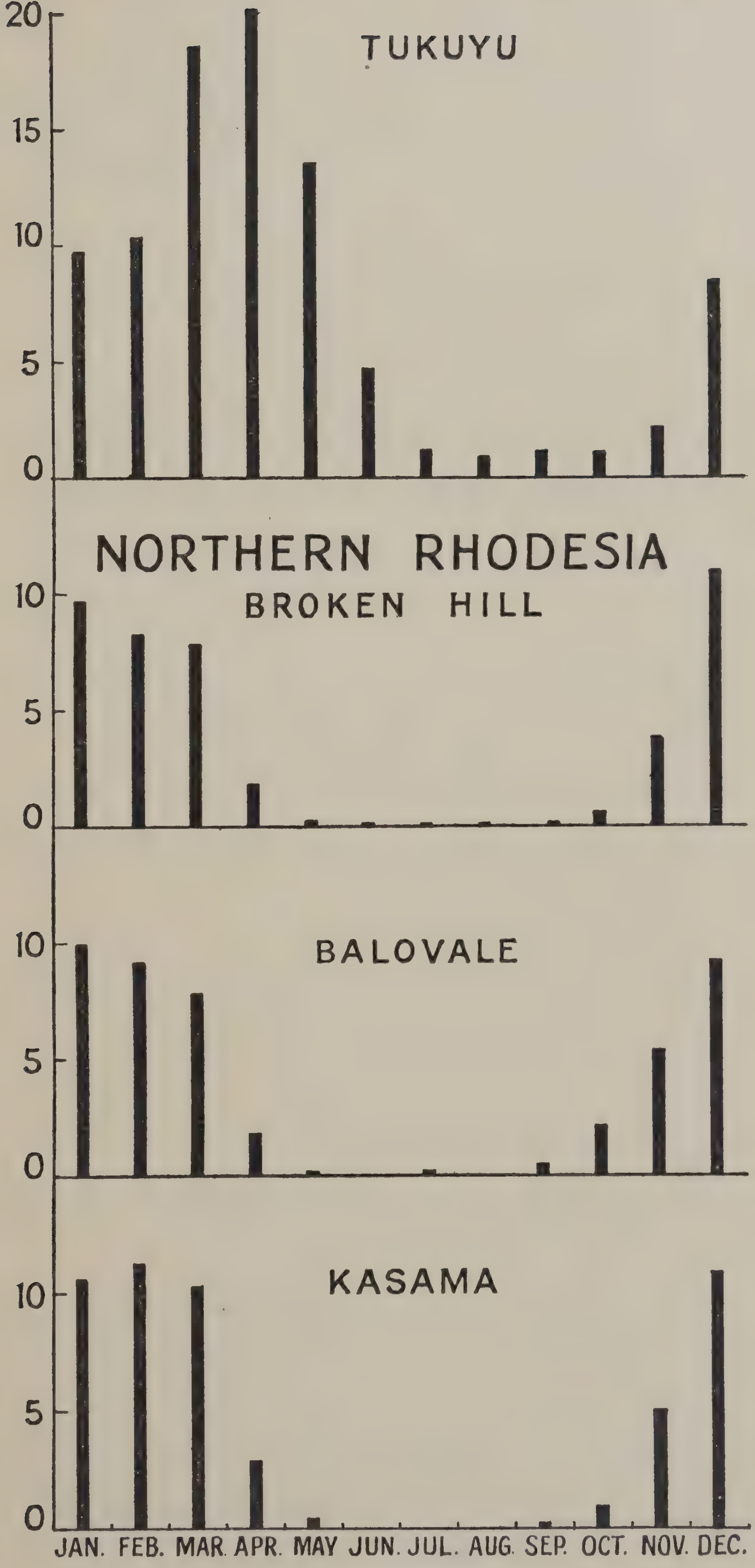

FIG. 2.—*continued.*

up, whereas the native areas are invariably denuded and burnt down.

The water table in the highlands is often found in the region of 15 to 20 ft., and irrigation by wells for garden use deserves far more investigation than has hitherto been given to it.

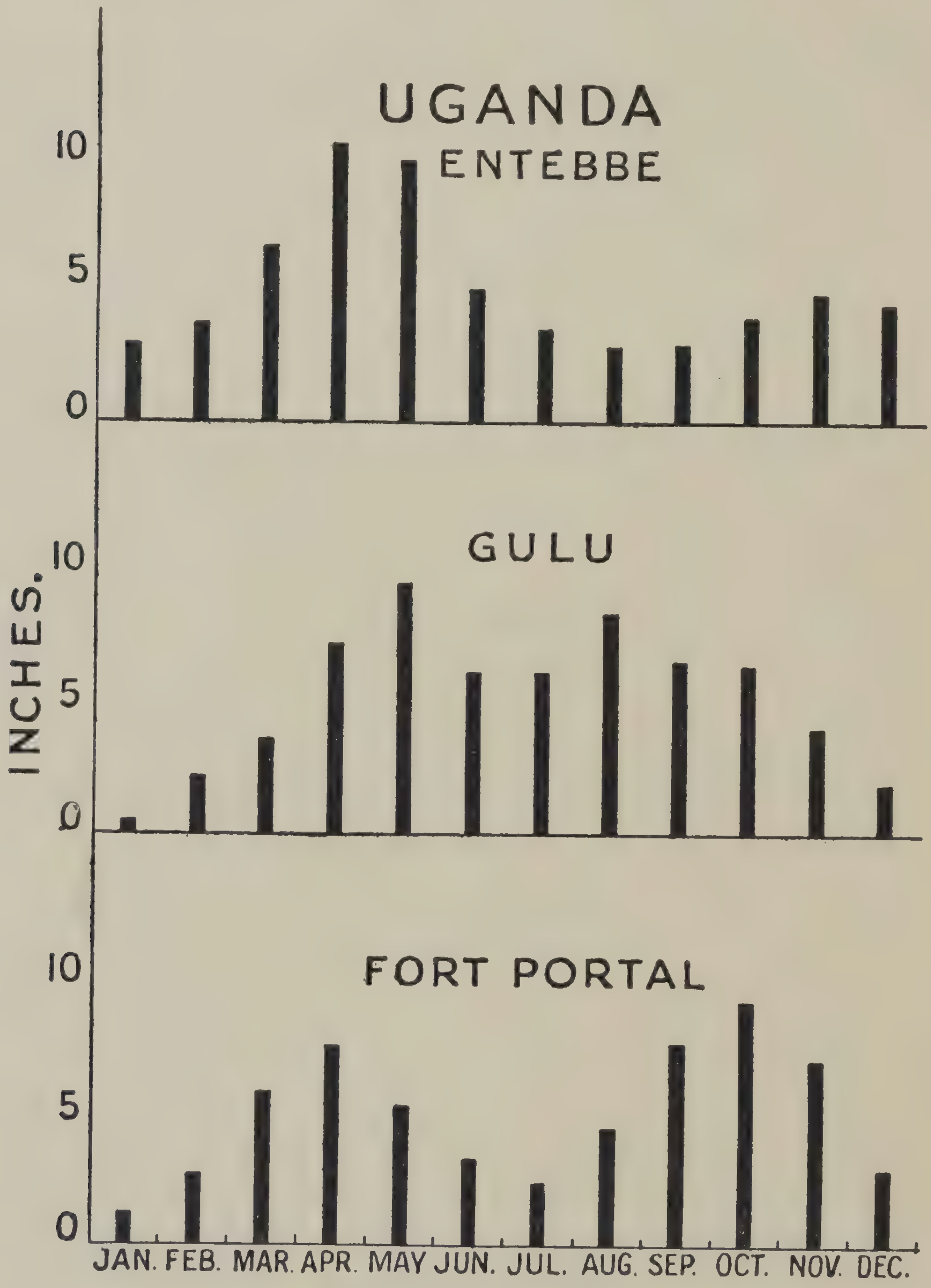

FIG. 2.—*continued.*

Heavy Rainfalls. Very heavy rains and washes occur at times, especially during thunderstorm conditions. The intensities which have been recorded in Nairobi during the past four years, for which hourly records are available, are indicated in inches in the following table :—

Max. in	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
24 hours	0·83	0·91	2·89	3·77	1·23	0·53	0·24	0·67	1·47	1·93	1·05	1·69
1 hour	0·37	0·33	1·27	2·52	0·43	0·27	0·11	0·39	0·36	0·74	0·40	0·70
15 min.	0·16	0·17	0·39	0·79	0·31	0·17	0·10	0·27	0·22	0·39	0·27	0·39

It will be seen in consequence that in laying out a garden it is advisable to make provision for heavy and sudden showers which may cause washing of the soil.

Hail. Hail is experienced at times, especially in the thunderstorms zones of the highlands bordering the Lake area. Over the greater part of the highlands, however, the occurrence of hail is rare and when it does occur is only of short duration.

Temperature of the Air. The seasonal change of mean temperature is indicated very clearly on the accompanying diagram. It will be seen that in the highlands it does not amount to more than 6·2° F. and in the coast region to 5·9° F.

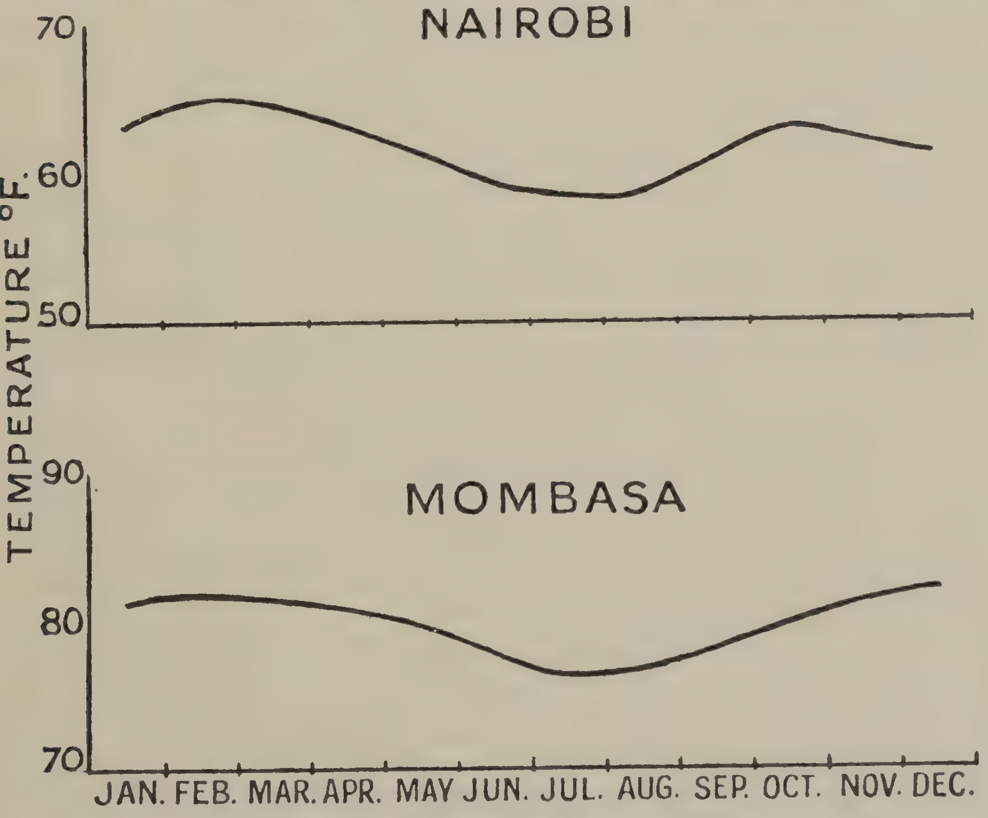

Fig. 3.—Seasonal Change of Mean Temperature.

In considering this seasonal variation it must always be remembered that plant life is affected more by the number of degree-hours to which it is exposed to temperatures above or below a critical value in the plant's life history than by the average temperature. It follows, in consequence, that a change in the mean daily temperatures of even 1° F. may result in a complete cessation of growth, if it takes place in the region of this critical value. This fact certainly accounts for the failure of certain economic crops in some years to give satisfactory results in the more elevated zones of the Colony.

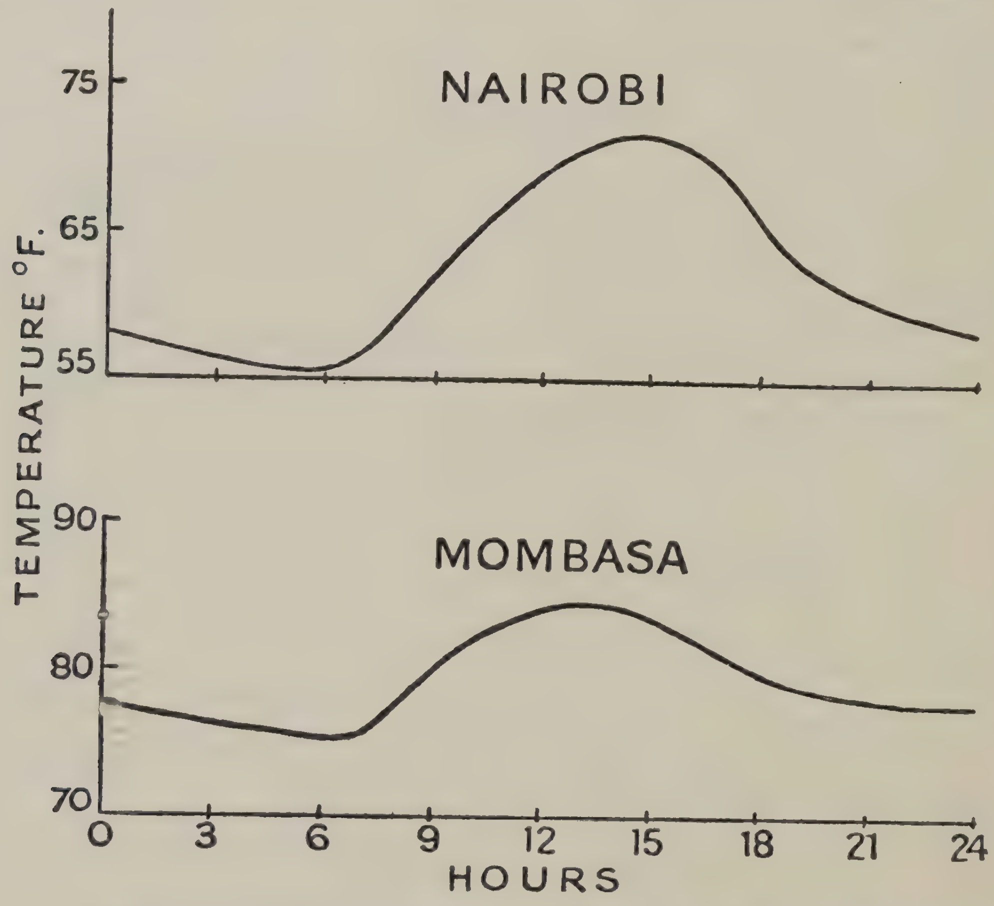

Fig. 4.—Daily Change of Mean Temperature.

While the seasonal change of temperature is small over the greater part of Kenya and tropical Africa generally, the daily change is considerable. This change is indicated in the accompanying Figure 4, which shows the diurnal variation on the same scale as the seasonal variation, both for the coastal regions and the highlands, amounting to 16·2° F. in the highlands and 9° F. in the coastal region.

The diurnal variation in temperature shown in Figure 4 is the average variation taken over a period of twelve months. A better picture of the changes in temperature that may be met with from day to day is given in the following two tables, in which the absolute maximum and minimum daily temperatures recorded at Nairobi and Mombasa in 1931 are set down month by month, together with the corresponding daily ranges of temperature. These two stations may be considered representative of the extremes of climate in East Africa generally.

Absolute Maximum and Minimum Temperatures at Nairobi and Mombasa, 1931.

Month.	NAIROBI.			MOMBASA.		
	Abs. Max.	Abs. Min.	Range.	Abs. Max.	Abs. Min.	Range.
	° F.	° F.	° F.	° F.	° F.	° F.
January	82·2	48·2	34·0	92·7	76·5	16·2
February	84·2	51·8	32·4	92·8	76·8	16·0
March	80·6	53·2	27·4	93·7	77·7	16·0
April	77·5	52·3	25·2	92·5	76·6	15·9
May	74·8	51·1	23·7	88·0	71·1	16·9
June	74·8	46·0	28·8	88·3	69·8	18·5
July	75·2	48·7	26·5	85·6	71·1	14·5
August	75·4	45·5	29·9	84·6	69·4	15·2
September	80·6	48·7	31·9	85·1	70·3	14·8
October	81·1	50·0	31·1	87·4	72·0	15·4
November	79·0	52·5	26·5	91·6	71·4	20·2
December	75·4	48·2	27·2	91·0	73·9	17·1

Mean Maximum and Minimum Temperatures at Nairobi and Mombasa, 1931.

Month.	NAIROBI.			MOMBASA.		
	Mean Max.	Mean Min.	Range.	Mean Max.	Mean Min.	Range.
	° F.	° F.	° F.	° F.	° F.	° F.
January	76·5	53·8	22·7	90·1	78·6	11·5
February	77·4	56·3	21·1	91·2	79·9	11·3
March	75·4	57·4	18·0	91·6	80·1	11·5
April	73·9	57·6	16·3	89·6	79·2	10·4
May	71·4	56·8	14·6	83·5	75·0	8·5
June	69·6	52·7	16·9	84·0	74·1	9·9
July	69·6	52·7	16·9	82·6	73·2	9·4
August	69·6	52·3	17·3	82·4	72·7	9·7
September	73·0	53·6	19·4	82·4	72·0	10·4
October	75·7	55·0	20·7	84·7	74·1	10·6
November	72·9	56·5	16·4	88·5	75·2	13·3
December	72·0	53·6	18·4	87·6	75·7	11·9

Frosts. Frosts occur in the higher parts of the Colony above 8,000 ft. With the intense solar radiation of these tropical zones the hoar frost soon disappears. Figure 5, showing the variation of temperature with altitude, indicates very clearly the zonal altitudes at which frost conditions may be expected.

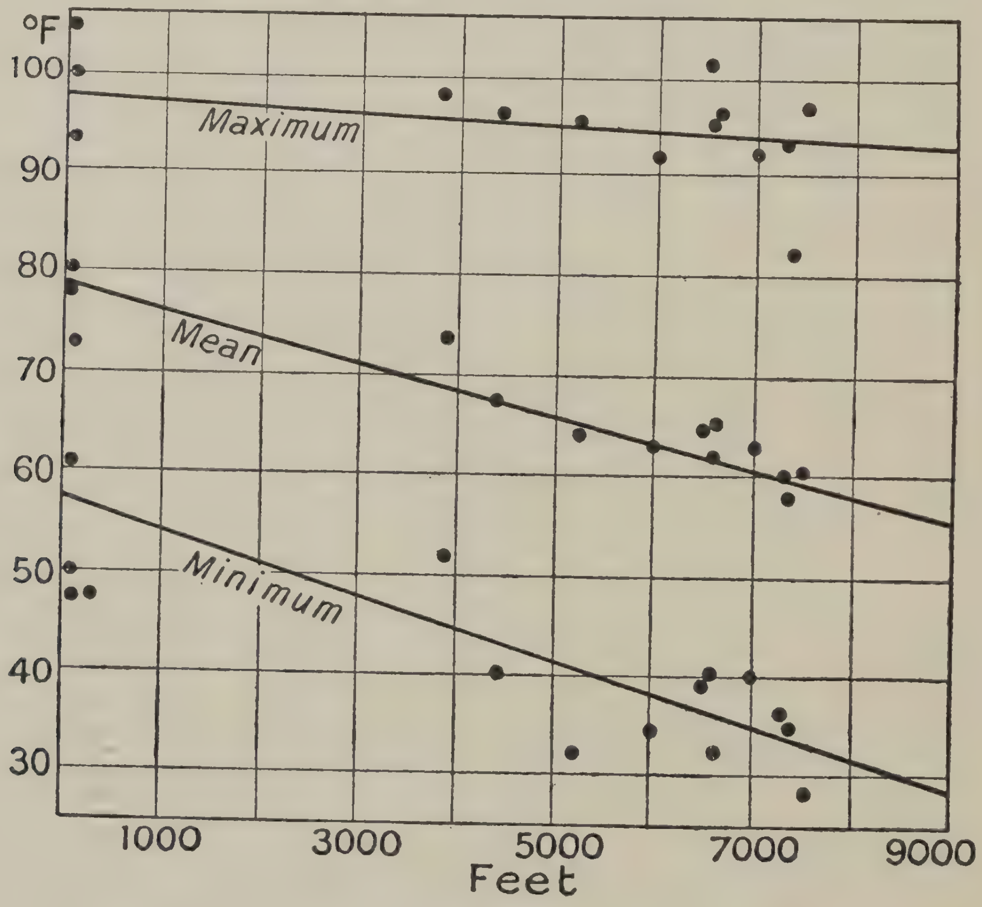

Fig. 5.—Variation of Temperature with Altitude.

Another feature which is often overlooked in considering the temperature conditions suitable to plant growth is the intense radiation which takes place on clear nights at the tops of shrubs. This radiation may at times produce a fall of temperature below the minimum air temperature in the usual exposure amounting to as much as 5° F. or more.

Humidity. The average relative humidity does not show very marked fluctuations. The mean monthly values at the Coast and Nairobi will be found in the following table, from which it will be seen that the mean monthly change during the year only amounts to 10 per cent. at the Coast and 11 per cent. at Nairobi.

	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	%	%	%	%	%	%	%	%	%	%	%	%
Mombasa	74	75	76	76	84	75	79	80	83	80	78	81
Nairobi .	73	73	78	83	84	82	79	78	77	69	79	77

The diurnal change is however very intense in the highlands in this element also. The accompanying diagram will give a very clear idea of the humidity conditions to which plant life is exposed.

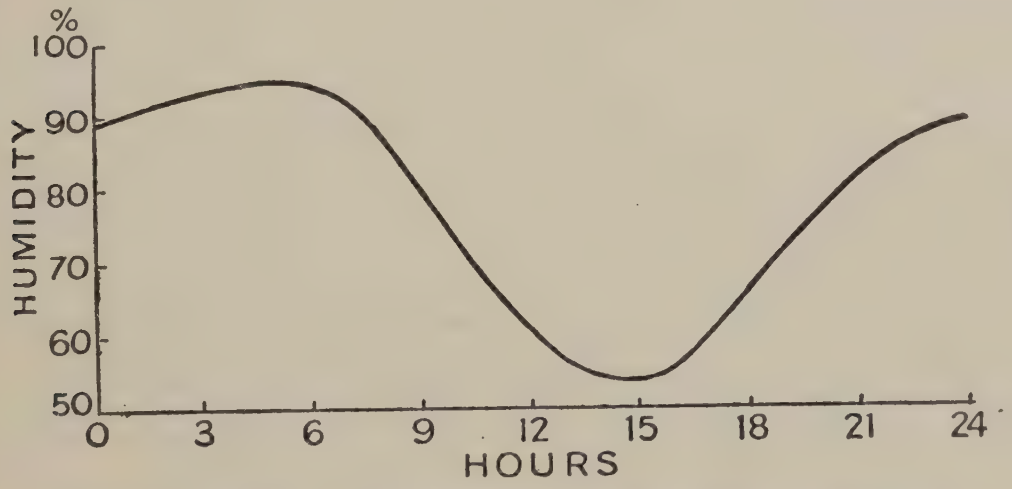

Fig. 6.—Diurnal Variation in Relative Humidity.

During the period of low humidities the evaporation is very rapid, and few plants can withstand these violent fluctuations without careful irrigation.

Evaporation. The daily evaporation from a free water surface is shown in tabular form below :—

Nairobi—in Inches

January . . .	0·22	July . . .	0·11
February . .	0·22	August . . .	0·14
March . . .	0·20	September . .	0·19
April . . .	0·16	October . . .	0·24
May . . .	0·12	November . .	0·20
June . . .	0·12	December . .	0·18

In many parts of Kenya this total evaporation is greatly in excess of the rainfall, and it suggests that a great deal might be done to mitigate these intense conditions by the use of suitable mulches.

Soil Temperatures. It is only quite recently that soil temperatures have been observed in East Africa. This factor must inevitably play a very important part in plant growth and in the development of plant disease. The variations in the first 12 to 15 inches are the most vital, and some idea of the changes which take place can be gathered from a preliminary series of observations made at the Kabete Observatory and shown in the following table, giving the average temperatures taken at 8.30 A.M.

(IN ° F.)

Depth.	1932				1933					
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
2 ins.	65·3	67·3	66·1	65·1	65·3	68·3	70·0	69·8	66·3	65·2
4 ins.	66·9	69·0	67·8	66·5	66·9	70·4	72·0	71·2	67·7	66·9
8 ins.	69·6	72·2	70·8	69·6	69·9	74·4	75·1	74·5	70·6	70·0
20 ins.	69·7	72·6	71·9	70·6	70·7	74·1	75·1	75·3	72·0	71·3
3 ft.	68·8	71·1	71·4	70·5	70·5	72·8	73·9	74·3	72·5	72·0

The effect of shading and mulches in modifying these conditions is too obvious to demand development.

Wind. East Africa is under three different wind systems, dependent in great measure on altitude.

The coastal regions are subjected to the two monsoon currents : the S.E. during the months of May to September, and the N.E. from November to March.

The highlands rarely feel the effect of the monsoon currents, except for short intervals in July and August. The prevailing winds in the higher parts of the Colony are from E.N.E. to E.S.E. and are definitely part of the upper air current which prevails over the equatorial zone.

The lake areas fall principally under the influence of convection currents, and suffer the variable winds of thunderstorm formations: winds of destructive violence only occur in these convection systems. They arise very suddenly and are of short duration.

From the gardening point of view, the only considerations which need be given to the wind system are to prevent the bending over of young trees under the influence of the prevailing steady easterly current, and by the use of windbreaks to check the wilting of plants by the desiccating midday winds in the hot weather.

Weather Prediction. A final note on the possibility of weather prediction may be of interest. As is not the case in the temperate regions, the barometer for the amateur is useless. The variations are so slight from season to season and in different weather types, that except in the hands of the meteorological expert the records are not significant.

It is believed that the prediction of rain for short periods at least will become possible to the Central Service by the intensive study of (1) the progress of the rain belts across Africa, (2) the pressure systems and upper wind régime over these territories, and (3) correlation of the general wind circulation over Central Africa with the passage of weather systems north and south of the tropical zone.

For the amateur, weather prediction in the tropics is never likely to become possible; but the patient collection of records, in which the amateur plays very often the most important part, and the analysis of these records in the Central Office are almost certain to lead to general indications of great value in estimating the probability of the early or late advance of the wet seasons and their probable intensity.

The importance of such forecasts in a region where full advantage has to be taken of the rains, if any successful agriculture and gardening are to be accomplished, cannot be over-estimated.

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CHAPTER II

THE SOIL AND ITS RELATION TO PLANT GROWTH

EVERYONE concerned with growing plants must, in order to get the best results, know something about the soil, its properties, and its relation to plant growth. A gardener should know his soil intimately if he is to succeed; his cultivation is intensive. The soil is not a mere dead thing; it is the home of an immense population which makes it more or less alive, and it is largely because of its life that soil is a good or bad home for higher plants.

The skeleton of the soil is derived from rocks by the processes of weathering; geologically the soil is merely an intermediate stage between one rock formation and another. Without going into details, which really do not affect the garden, the nature of the soil depends on three factors—namely, the nature of the parent rock, the climate during its formation, and the drainage. Thus in Kenya the volcanic formations have given rise to fine-grained soils, while the granitic rocks, containing much quartz, are the parents of more sandy soils. In old forested areas the red soils are typical of fairly heavy evenly distributed rainfall and good drainage; the black soils, characteristic of the plains, are the products of poor drainage. It is probable that by improving the drainage one would in time convert a black cotton soil into a red soil.

During the processes of weathering the minerals constituting the original rock either are broken down into simpler minerals or are merely released from the parent mass. The former give rise to the finer portions of the soil, the clay and silt fractions, the latter to the sand grains. While the weathering proceeds organic matter, consisting of the residues of plants and animals that have managed to scrape a living from the mass of rock fragments, is added, and this not only speeds up weathering but also improves conditions for plant life. Our youngest soils in East Africa are the volcanic ashes which are mainly unweathered rock fragments with a modicum of humus. Among the most mature are the red soils derived from the early volcanic formations, where hardly any unweathered minerals are left ; here the soil may be anything up to 50 ft. in depth, and humus is well distributed through the upper layers.

The constituents of a typical soil are sand, silt, clay and humus. These inorganic mineral fractions grade into each other ; seldom is there any sharp separation, and as their particles decrease in size, alter in their properties and characteristics. Coarse sand is very inert and without cohesion. The fine sands, being lighter, are apt to run together when wet to a compact mass which dries to a brick-like mass. Clods of fine sand readily break down when wetted, but dry again to a compact mass. Seedlings often fail to penetrate the crust of a soil rich in fine sand. The coarser silt particles are very similar in their characteristics to fine sand. The finer silt fractions begin to approach clay in property.

Clay is one of the most important constituents of soils. It belongs to that wonderful class of substances known as colloids, and when one reads of the colloid complex of the soil, clay and the other important soil colloid, humus, are being referred to. Clays have the property of swelling on wetting and contracting on drying. In some soils this property of the clay is less marked than in others, depending on its nature. That from black cotton soils swells more than that from the red soils, for which reason in the black soils cracks in dry weather are wider than in the red soils. By virtue of this property and its fineness, clay is able to act as a cement between other soil particles and rather alters their properties. In a fine sand, for example, there is always a tendency for brick-like clods to be produced, while in a fine sandy loam there is no longer this tendency provided the soil is properly treated ; the clay has cemented the individual sand grains into complex particles or crumbs, which are not so liable to pack together. The old-fashioned practice of 'marling' to improve light soils is simply the addition of clay to produce crumbs.

The cementing power of clay is not permanent. When wet the clay is apt to act as a lubricant, and, under any force, to permit the particles forming the crumbs to pack together. This is the reason why soils worked improperly or at the wrong time give hard clods. The clay of our typical red soils is not so sensitive to moisture changes as is that of the black soils, and the cementing power is more permanent. Red soils containing much clay are readily worked under conditions in which black soils containing half the amount of clay would be spoilt.

The other important soil colloid is humus. This, too, has a cementing effect, but, as is not the case with clay, it is permanent, and thus humus improves both clayey and sandy soils, cementing the particles in each into complex crumbs which do not break down on wetting.

Besides these properties the soil colloids have others of even greater importance ; it should be mentioned here that in addition to humus and clay each soil particle has a thin film of colloidal material covering it. All of these colloids have acidic properties, and thus have the chemical power of binding basic material that is of value in plant nutrition.

So far the mechanical make-up of the soil has been considered ; the main point is, How does this affect plants ? The factors affecting plant growth are :

1. Light.
2. Temperature.
3. Air.
4. Water.
5. Supply of nutrients.
6. Absence or presence of deleterious factors.

Of these, all but the first, are or may be soil factors.

Although light is not a soil factor, certain aspects of the light factor may be discussed in passing. We all know that plants by the aid of light are able to synthesise their own food supply from carbon dioxide, water, and simple salts ; but what one does not always appreciate is that each plant does best at one definite intensity of light. According to the environment in which it has evolved, the plant has adapted its mechanism to the special light conditions that prevailed there. Unless the light intensity is close to that required for optimum growth the plant does not give its best. Thus many plants typical of forest undergrowth are stunted when grown in the open garden. The limit of this effect is the destruction by heavy shading of weed seedlings that require a strong light for their optimum development.

Temperature too is a factor that mainly affects the aerial parts of the plant ; there is, however, an effect upon the roots. Unless the temperature of the soil is between certain limits there is no growth. The regulation of soil temperature is intimately connected with the water factor and will be referred to there. One aspect, however, must be discussed here. It is evident that soil on a slope receives less heat from the sun than soil on the level. The question is which slope is the best. In the writer's opinion an easterly slope gives the best results. It catches the early morning sun and the soil warms up earlier and deeper ; towards evening it no longer is heated, so that when the sun sets there is not a rapid temperature drop. The westerly slope warms up late, and when the sun sets, the soil is warm and there is the rapid temperature drop that damages delicate plants.

That air is a soil factor is not often realised. Roots require an adequate supply of air as much as do the leaves ; where conditions are such that the soil does not have a good air supply, as under swamp conditions, any plants that thrive there are those that have developed special root systems that enable them to get air. Here, too, the soil air supply is intimately connected with the water supply in the soil.

In an actively growing plant water constitutes more than three-quarters of its weight, and in addition water is continuously being respired, some plants being more lavish in their requirements than others. The importance of water to plants is one of the first requirements to be noticed, but too often the soil is over-watered.

In the soil water exists in three forms. The first is the water existing in a dry soil very closely bound to the individual soil particles. This form is of no value at all to plants. It is spoken of as hygroscopic water.

The second form is the capillary water and is the most important to plant life, constituting the main water supply. It exists in the form of a film around the soil particles, like the hygroscopic water, but its film is thicker. The thicker the film the more readily is water taken up by the root-hairs. As the thickness decreases so the resistance offered by the film to removal increases, until a point is reached at which the root-hair can no longer absorb water. About this point permanent wilting occurs.

As capillary water exists on the surface of the soil particles, the finer grained a soil is the greater is the amount of water it will hold. Thus a loam is more retentive of water than a sand, and a clay than a loam. On account of the very high specific heat of water, a clay is colder than a loam and a loam colder than a sand. And the movement of water in a soil depends upon the nature of the surface. In a sand, the movement of water is fast. It moves down rapidly and also will move upward rapidly. On account of the small film of water it is capable of lifting, water will not rise high in a sand. In heavier soils, the movements downward and upward are both slower, but the height to which water will be lifted is greater. In a heavy clay soil so slow is the movement of water that, although there is an ample supply of water well within the reach of the lifting power of the soil, plants may die of drought.

The third form of water is free water. This is water that has passed beyond the attraction of the soil particles and can no longer be retained as a film, but oozes into the spaces between them, displacing the air. If the presence of free water is only temporary, plants are able to make use of the water. If, however, the condition lasts for some time, or becomes permanent, a condition of permanent water-logging, the roots lying within the zone of water-logging, being cut off from the air, will die.

Where the crumb structure of a soil is well developed the danger of free water having a deleterious effect is less marked. The large spaces are less liable to be filled with water, and also more air may be trapped in the spaces. In heavy soils, where the pore spaces may be individually small and free water forms readily, it is essential to promote the formation of a well-marked crumb structure by adding humus and, if necessary, by liming.

It is thus seen that a soil which retains little water warms up quickly ; at the same time it will cool down rapidly later. Plants on such soils may be exposed to rapid temperature changes and suffer accordingly. Soils which retain plenty of water are more even in temperature, but an excess of water will tend to keep the temperature down, perhaps below the optimum. Also it will lower the intake of plant nutrients.

The main plant nutrients are nitrogen, phosphorus, and potassium ; and, required in lesser quantities, calcium, magnesium, iron, manganese, sulphur, and a number of others in even lesser quantities. These are all essential to plant growth, and if one be absolutely deficient, no matter how well supplied the soil may be with the main nutrients and other minor nutrients, the soil will be sterile. Thus, it is only during the past few years that it has been realised that copper, which is present in most minute quantities in soils, is an essential plant nutrient. By the application of small dressings of copper salts tomato growing has been rendered possible in certain parts of Florida.

As far as the major plant nutrients are concerned it is highly improbable that any soil will be entirely lacking, but soils are often deficient in one or more of them. It is the supply of the one present in the smallest quantity that limits the growth of plants. Thus in a soil deficient in phosphates, application of nitrogenous or potassic fertilisers will have no result, while the application of a phosphatic fertiliser will have most marked effects. Generally in gardening one should use complete manures, rather than one supplying a single nutrient.

Nitrogen is usually absorbed by plants in the form of nitrates ; some plants are capable of using nitrogen in the form of ammonia. In the soil, by the processes to be discussed later, nitrogen compounds are converted into nitrates.

A deficiency of nitrogen is fairly easily recognised. The plants are stunted and generally yellowish green in colour ; occasionally the colour, especially in some Cruciferae, may be reddish or purplish green. These colour changes are general over the leaf and not confined to certain zones. In fruit trees the leaves drop prematurely, the tips die back, lateral buds die, and the fruits are often unusually coloured.

The effect of increasing the nitrogen supply is readily observed. Addition of a readily available nitrogenous fertiliser, such as a nitrate, causes a rapid disappearance of the above symptoms. The colour becomes a deeper green, the leaf growth and the height of the plant are increased. Increasing the amount of nitrate makes the leaf growth larger and more sappy. Lettuces, cabbages, and other leafy vegetables may be improved in quality by judicious manuring with nitrogenous fertilisers. Further increase of nitrogen, by increasing the sappiness, makes the plants more susceptible to fungus diseases. Flowering is also considerably retarded.

Phosphates are the best phosphorus nutrients for plants. Lack of phosphate is not recognisable by such definite symptoms as is nitrogen starvation. There are a few definite signs of phosphate deficiency varying with individual varieties, but they are not easy to recognise. Phosphates increase root growth considerably, a desirable asset where droughts are to be expected. They also speed up flowering and ripening.

Potassium is utilised by the plant from all the common soluble potash compounds. Marked deficiency in potash is shown by the leaves dying from the tips. The leaves of fruit trees die in patches, giving the appearance of being scorched. The presence of an ample supply of potash enables the plant to make a better use of the water supplies. It increases the efficiency of the leaves, and acts as a counter to the effects of an over ample supply of nitrogen by giving tone to the leaves and making them more resistant to disease.

Some plants require much more calcium than others. Certain plants, notably citrus trees, when starved of calcium develop peculiarly mottled leaves which may be replaced by yellowed leaves. In others the leaves will die or the root system be stunted and discoloured.

There is not much danger that a lack of magnesium will appear under most gardening conditions. Where the soil is short of magnesium and much dung has been used, certain symptoms may be seen. Most fertiliser mixtures now being imported into Kenya contain a small amount of magnesium salts which will meet any deficiency.

The iron supply in most soils is ample for the needs of plants. Even in the ' Nakuruitis ' areas, where the vegetation does not contain sufficient iron to support stock, the plants do not appear to suffer. Sometimes on soils that have been heavily limed plants will turn yellow. This is due to an immobilisation of the iron and manganese in the soil.

In the soil, however, many of the plant nutrients exist in a form unavailable to plants. Nitrogen is largely present in the form of complex compounds associated with humus. Phosphates too may be present associated with humus. These are rendered available to plants by the action of microbes. The complex nitrogen compounds are first acted upon by one group and converted into ammonia. Microbes of a second group then become active and convert the ammonia into nitrates. Complex compounds of phosphorus are at the same time decomposed with the liberation of soluble phosphates.

The action, however, is not quite as simple as it appears. Part of the nitrogen is locked up in humus and only gradually is broken down. Some of the nitrates produced may be used up by microbes in decomposing organic matter poor in nitrogen. On the whole, however, there is a balance of nitrate nitrogen which in a soil in good condition is adequate for the needs of most plants. The point is to maintain the soil in good condition by the use of organic manures.

For these microbes to work well it is essential that the soil be well aerated. Where soils are badly aerated, as in water-logged or compact soils, a group of bacteria known as the denitrifiers becomes very active. These utilise the nitrates, liberating free nitrogen which is lost to plants. The groups of microbes, the ammonifiers and nitrifiers, responsible for rendering the complex nitrogen compounds available to plants, do not work best under acid conditions. On acid soils an application of lime, by neutralising acidity, will speed up nitrification with most marked results. But the nett result is that the reserves have been mobilised and the soil exhausted. Whence the old saw :

> Lime and lime without manure
> Makes both land and farmer poor.

Lime under acid conditions must be used with care and sparingly.

In addition to the bacteria rendering nitrogen compounds in the soil available, there are two groups which are capable of fixing atmospheric nitrogen. The one group is free, living in the soil and using the organic matter in the soil as food. The other group lives in symbiosis with legumes. These bacteria infect the roots of legumes, producing nodules in which they live, obtaining food from the plant, and fixing free nitrogen which is passed on to the plant. Legumes thus obtain the greater part of their nitrogen requirements from the bacteria and very little from the soil. When they die off there is a small residue of nitrogen added to the soil. The bacteria from one species of legume may not infect another. There are definite strains of these bacteria, which are specific to definite groups of legumes. Thus, the bacteria from the garden Peas will infect Sweet Peas but not Beans. The Beans form another group with their own specific organism. While legumes will grow well in a rich soil without being infected, they grow better if they are infected, and, in order to get the best out of legumes, one should see that the strain of bacteria needed to produce nodules is present. This is easiest done by obtaining soil from a place where the legume has carried nodules.

Besides bacteria there is a definite fauna in the soil. Earth-worms we all know about, but there is also a micro-fauna. There are present in all soils protozoa which live upon the bacteria. Under certain conditions, especially under greenhouse conditions, the protozoa increase to such an extent as seriously to depress the numbers of the bacteria, with the result that nitrification changes do not follow properly and the soil is rendered incapable of carrying plants. There is also a group of parasitic worms, eelworms, which infest roots, bringing out great nodular lumps sometimes mistaken for bacterial nodules. Eelworms reduce root-growth tremendously, and also use up the food produced by the plant, making the plant most unhealthy.

Both protozoa and eelworms can be reduced considerably in numbers by ‘partial sterilisation.’ Steaming the soil or burning brushwood over the infested soil will kill off most of these organisms. Certain volatile antiseptics may also be used. Carbolic acid or other antiseptics of the carbolic type have been used with success. Naphthalene, vermikol, cyanogas, all have a partial sterilising effect.

The last factor to be considered is the absence of deleterious conditions. The condition most likely to occur, beyond such as water-logging, bad aeration, etc., referred to above, is soil acidity. Soil acidity is generally due to the soil colloids, clay and humus, which are both acidic, not being saturated with bases such as potash, lime, and magnesia among others. The first effect is that plants are unable to obtain potash, lime and other nutrients readily. They are retained by the colloids. Secondly, the definite acidity may affect plants detrimentally. The cure for excessive acidity is liming. The lime combines with the soil acids, neutralising them.

It is only when the acidity becomes excessive that there is any need to worry. Most plants are capable of growing well under moderate conditions of acidity ; even lime-loving plants will grow well in acid soils provided that there are adequate supplies of lime compounds in the soil. As has been pointed out above, indiscriminate liming is apt to lead to bad results. Lime should be applied with care, and under most conditions in Kenya dressings from 2 to 4 oz. per square yard should be ample for most gardening conditions.

CHAPTER III

MANURING AND TILLAGE

The first meaning of the word 'manure' was the hand working of the soil. Defoe uses it in this sense in *Robinson Crusoe.* Later the meaning became extended to cover any operation which improved the soil, such as cultivation, marling, liming, and the application of what we now call manures. The cultivations, the original manuring, later were termed 'tillage,' a term still in use. There is now a tendency to restrict the word 'manure' to designate the natural materials, such as farmyard manure, of fertilising value. The artificial manures, especially those which add a single main element only, such as sulphate of ammonia or superphosphate, are generally spoken of as 'fertilisers.'

In the preceding chapter on soil, there was no attempt to discuss any of the tillage operations. Soil, under natural conditions is rather compact; it is only where enormous quantities of humus are present or in process of formation, as under forest conditions, that the soil is naturally open and friable. Under cultivation the desire is to obtain the best yields or the best growth. This cannot be secured in a compact soil. The soil microbes work most efficiently in a well-aerated soil. Cultivation by breaking a compact soil into small crumbs increases aeration and so the bacterial activity. The amount of plant nutrients available is increased and thus there is better growth.

There is another aspect of general cultivation. In order to get good germination of seeds they should be in intimate contact with the soil, and yet, at the same time, the soil should not offer resistance to penetration by the delicate roots of the seedling. A good seed-bed is one in which the soil crumbs are fine and yet well developed. In other words, a good tilth gives a good seed-bed.

Soil in a good tilth increases the absorptive power for water. The large pore-spaces allow of water entering readily and passing down quickly. There is less likelihood of surface water collecting on a soil in good tilth than on one in bad tilth, and thus less wash. After the rains, if the crust, which forms naturally, is broken by hoeing, capillary connection between the surface soil and the moist soil below is broken. The loss of water by evaporation is thus considerably decreased. Another way of doing this is by means of mulches of grass, well rotted manure, or special kinds of paper.

Both of these methods of reducing evaporation of moisture are in wide use in the hotter drier parts of the world. The breaking down of the soil crust to a mulch is the basis of the so-called 'dry farming.' The formation of a soil mulch after the rains is a common practice in Kenya coffee plantations. There it is generally produced by cultivators or fork jembies. In gardens, except vegetable gardens where the plants are in rows and little wheeled cultivators can be used, mulches would generally be produced by hand labour with a hoe, panga, or a special tined hand cultivator. The surface soil is simply stirred with one of these implements to a depth of an inch or two. Cultivation can be overdone; continuous stirring breaks the soil crumbs, making the soil dusty. Only enough cultivation to maintain a loose surface layer should be done. The red soils of the type around Kyambu, when in good condition, will be found to produce a mulch spontaneously and will need very little cultivation.

Mulches of grass and well-rotted manure should be used as much as possible. A layer of an inch or two will be found to be most efficacious and will, as well, improve the soil structure.

There is another tillage operation, rolling. In a soil in good tilth it often happens that insufficiently intimate contact between seeds and soil is obtained. The seed does not get an adequate supply of water, or the root is not properly supported. Rolling compacts the soil somewhat, bringing the soil crumbs into close contact with each other and with seeds, which thus receive an adequate supply of water. The rolling must not be too heavy, nor must it be used when the soil is wet, or the soil crumbs will be broken down and the soil made too compact.

The tillage operations by improving soil aeration increases the activity of the soil microbes. The humus which had been accumulated in the soil is converted into plant nutrients. Under gardening conditions the humus supply soon drops to a dangerously low point. The soil breaks down to a dust, wash is liable to occur, and the plants are no longer as vigorous as at first. Artificial fertilisers will restore the vigour of the plants but will not generally improve the texture of the soil. What is needed is a bulky organic manure of the type exemplified by boma manure, which will be converted into humus in the soil, thus improving the general soil conditions and supplying food for the soil bacteria. The supply of plant nutrients will in this way be extended over the whole year.

Boma manure, including goat manure, is usually badly contaminated with weed seeds. These one does not want to introduce into a garden. There is also the possibility that, if a very heavy dressing of boma manure is given, the preliminary rotting may affect the plant deleteriously. Before using boma and goat manure they should be made into heaps, mixed with grass and weeds, and then well watered. Rotting will soon start with the production of much heat. Usually within a few days the temperature reached will be more than can be borne by the hand. All weed seeds in the heap will be destroyed. To kill those on the outside the heap should be remade, putting the part on the outside inside the pile, and rewetting. The product of this fermentation should be nearly black and easily mixed with the soil.

Stable and boma manure which have a great deal of litter mixed with them should be rotted before being applied.

In such manures the litter used has absorbed a good deal of urine. Rotting will be rapid, and while proceeding in the soil, there may be a lack of nitrates and most certainly an excess of carbon dioxide in the soil air. All plants will suffer, and delicate plants may even be killed if the application is at all heavy. As litter is apt to make the manure rather open, in building the pile one should compact it fairly well, and keep it moist. When fermentation is rapid high temperatures are reached and the pile dries out. A dry pile is apt, after rapid fermentation, to fire spontaneously. Here, too, the product should be nearly black, and, if fermentation is complete, without any fibre.

Where the soil is open or sandy the manure applied should be well-rotted stable manure or boma or goat manure without fibre. The soil requires cementing together into crumbs by humus. For heavy soils the manure should have a fair amount of long fibre which in rotting in the soil leaves little channels through which water and air can move.

It often is not possible to obtain sufficient boma or stable manure to keep a garden in good condition, but in a garden there is always a great deal of waste organic matter, lawn clippings, weeds, old up-rooted or cut-back plants, that can all be converted into a good manure.

The simplest way of converting garden rubbish into a manure is to throw everything into a pit while still green, trusting to the rain to wet it. This gives quite a good manure, but there is a good deal of waste, and generally only the oldest stuff is fit for use, but it most certainly is better than burning the rubbish. A better way of converting one's rubbish into manure is to have a few compost heaps or, better, pits, in a corner of the garden fairly close to water. Into these is placed all the vegetable waste of the garden, lawn clippings, weeds, up-rooted plants and even hedge clippings, if these have been soaked, in layers and well tramped. Over each layer rock phosphate or bone-meal is lightly sprinkled and then the heap is watered fairly heavily with a solution of ammonium sulphate; ½ oz. per gallon will be ample. The heap need not be completed at one time but added to as material becomes available. Care must be taken to put weeds, especially seeding weeds, and coarse woody materials into the middle of the heap where they will be subjected to the severest fermentation. Also compact the heap well, or it will dry out too fast and may catch fire. The heap should be made about 4 feet high or if a pit is used this should be piled up about 2 feet above ground level. After 8 to 10 weeks from completion of the pile the manure will be ready for use. The reason for the use of the phosphates and sulphate of ammonia is to improve the quality of the manure and to assist rotting.

These bulky manures should be dug into the soil so as to get them well mixed with the earth. Only by so doing does one obtain the greatest benefit—namely, the improvement of the soil texture and the establishment of a reserve of nutrients which, by the action of bacteria, is rendered available to plants. This, of course, means that these organic manures can only be applied before planting. Suitable applications are 2 to 10 lbs. per square yard.

There are a few cases where it is worth while applying organic manures on the soil surface. If the material is definitely low grade, such as dry lawn clippings or other grass, it is better to apply it as a surface mulch. Digging such material into soil shortly before planting out, or among growing plants, will produce deleterious results. In order that the organic matter may rot, nitrogen must be used. The available nitrogen in the soil is used by the bacteria for this purpose, and the plants suffer from a nitrogen deficiency. Used as a surface mulch, water is preserved in the soil and rotting is so slow that there is no danger of nitrate deficiency affecting the plants.

Very well rotted manure that has fallen to a powder where it cannot be dug in may be applied as a surface dressing. Lawns and shrubberies may be treated in this way. Generally, however, it would be best to use the bulky organic manures for land which is often dug up, and to reserve artificials for lawns.

For convenience fertilisers may be divided into nitrogenous, phosphatic, potassic, and compound.

The main straight nitrogenous fertilisers are sulphate of ammonia, nitrate of soda, nitrate of lime, calcium cyanamide or nitrolim, and nitrochalk. Of these practically only the first two will be used in garden practice. Sulphate of ammonia is a fertiliser that tends to make soil more acid, for which reason it is a valuable fertiliser for lawns. The growth of grass is encouraged, while clover and other weeds tend to disappear. A suitable rate of application is 1 to 2 oz. per square yard. As it may be difficult to apply evenly it may be mixed with sand or soil and scattered over the grass. Nitrate of soda is readily available and is useful, in very light applications, to push on or improve the quality of leafy crops such as lettuces and cabbages.

The main straight phosphatic fertilisers are superphosphates, rock phosphates, basic slag, guano phosphate, and bone-flour. Superphosphate and double superphosphate will be found to be of general value. Where much bulky organic manure is used it is essential to use them or other suitable phosphates if phosphate has not been added to the manure in preparation. They should be used at the rate of 2 oz. of the former and 1 oz. of the latter per square yard every two or three years. On sour soil or heavy clays rock phosphate, basic slag, or guano phosphate should be used instead. These phosphates are also used in preparing composts and other bulky organic manures.

Bone-flour is a very valuable phosphatic manure for East African conditions, and perhaps safer in general use than superphosphate. It is not quite so quick acting as superphosphate nor so slow as the rock phosphates. It may be substituted for either group. In addition it contains a certain amount of slowly available nitrogen, which is an added advantage and makes it almost a general manure for Kenya gardens.

The potassic fertilisers in general use are sulphate and muriate of potash. It is not often that it will be necessary to use these by themselves in gardening practice. All the potash that will be necessary under most conditions will be supplied either in boma or other manures.

Most of the richer compound fertilisers supplied by the firms dealing in fertilisers will be found very useful in the garden. Variation in composition will not have any marked effects. There are a number of special garden fertilisers on the market ; but usually the prices charged are exorbitantly heavy, even taking into consideration the small packages in which they are packed. Considering the size of Kenya gardens, it would be far cheaper to buy 2 cwt. bags of the desired fertiliser, perhaps one designed for coffee, than to buy small quantities of the special horticultural mixtures. There is only one point to bear in mind and that is, if the garden has been receiving much bulky organic manure the compound fertiliser should not be rich in nitrogen.

As far as lime is concerned one should not use it too freely. Most garden plants will thrive in slightly acid soils, and lime should be used more as a fertiliser than to correct acidity. Dressings of not more than 8 oz. per square yard may be given every four or five years. But do not apply lime alone, especially to a poor, tired soil. Precede or follow it with bulky organic manure.

There is another class of organic manures eminently suitable for gardening. These are the concentrated organic manures, abattoir wastes, and guanos including poultry manure. In these the nutrients are not immediately available, but become so very shortly after application. All of these are or will very shortly be available in Kenya. Blood-meal is often used in intensive gardening. It is rapidly rendered available, leaving no deleterious residue in the soil. Blood-meal is now being made in Nairobi at the Municipal Abattoirs. It may be used wherever a quick supply of nitrogen is required, at the rate of ½ to 1 oz. per square yard. Meat-meal and meat- and bone-meal are two other bye-products that are available. Meat-meal is essentially a nitrogenous manure, meat- and bone-meal both nitrogenous and phosphatic. Meat-meal will be slightly slower acting than blood-meal, and is a useful garden manure.

If used to enrich potting composts the mixture should be allowed to mellow for a week at least. Meat- and bone-meal is a more general manure, and may be used freely in gardens to get quick results. A suitable dressing would be 1 oz. per square yard. In the fruit orchard it should be mixed with one quarter to one third of its weight of sulphate of potash and the mixture used at the rate of 1 to 2 lb. per tree, scattered evenly over the feeding zone of the roots and cultivated into the soil.

True guano will shortly be available (1934) from coastal islands. This will form a valuable garden manure and may be used in the same way as meat- and bone-meal. Here, too, it is very important to allow potting composts enriched with guano to mellow.

Poultry manure will be found a valuable garden manure. It resembles guano in its properties and should be used in the same way. The manure should be collected fresh, dried and ground. Those gardeners who also have poultry pens should be able to meet most of their manurial requirements, as poultry manure mixed with one-third to one-half its weight of fine bone-flour will provide one of the best general gardening manures.

CHAPTER IV

ELEMENTARY HORTICULTURE

Propagation by Seed—The Seed Box—Preparation of the Soil—Treatment of Seedlings—Watering—Planting Out—Sowing Seed in the Open—Period of Germination—The Shade House—Preparation of Flower Beds—Plant Nurseries.

Propagation by Seed. A good deal of preparation is necessary in the raising of plants from seeds. Though they may be put straight into the open ground, this is rather a wasteful way of proceeding, as seeds so sown cannot be so carefully tended as when in a seed-box ; also they often germinate much too thickly, and the small seedlings displaced by the process of thinning out are apt to be thrown aside and wasted.

The Seed Box. Any box will do for this purpose, but those used by Forestry Departments are most suitable in every way. They are about 16 inches square and 4 inches deep, and are made of cedar ; the wooden slats cut ready for making them up can be bought at the timber yards. In putting a seed-box together leave plenty of space between the slats forming the base, to allow for drainage ; if this is not done it is quite necessary to bore good-sized holes, as so much depends on free passage for excessive moisture.

Having made the box, proceed to prepare it for seed. First place a layer of broken stone all over the base, on this spread dry leaves or moss, or sweepings from beneath trees ; next comes the soil, the preparation of which we will speak of later. Fill the soil in to within half an inch of the top of the box ; level it and press it down fairly firmly, water *well* and let the whole get a good soaking. Then take dry soil and sieve finely and evenly over the whole surface, employing a fine sieve such as is used in the kitchen. In half an hour or so this will have absorbed moisture from below and be ready to receive the seed. Sow thinly *always*, and using the same fine sieve cover the seed with soil to the depth of twice its diameter. Be very careful not to bury it too deeply ; it is not necessary to water again immediately after sowing. Label and protect from the sun to prevent evaporation ; a sheet of newspaper or an inverted box will answer this purpose. Directly germination has taken place the covering should be removed ; and watering must be attended to throughout as is described below.

Preparation of the Soil.—In certain favoured areas such as old forest land, ordinary surface soil with a little sand added will be suitable for use in the seed-box ; but it commonly happens in gardens that the soil available has been worked out already, or is too heavy or coarse to be profitably used for seeds. In this case it is necessary to make up a good open loam, such as may be got from a forest. This is done by digging out a pit for rotting vegetable refuse in, say 5 feet deep and the same in diameter. All leaf sweepings and vegetable waste from the garden and kitchen should be thrown into this pit to rot, together with an occasional layer of lime if possible ; and an occasional watering in dry weather will be of benefit here. When the pit is filled, cover it with a few sods and start another pit. After some months, a rainy period having intervened, open up the covered pit and sieve out its contents, which will be ready for use, using a coarse or quarter-inch sieve. Take two parts of this decomposed vegetable refuse, two parts of ordinary garden soil, and one of sand ; mix well together, and you should have a good, light, porous loam which will enable the seedlings to root easily.

Treatment of Seedlings. When the seedlings are well up and growing strongly, give plenty of water and light ; as a rule they are better without shade at this stage. When they have got their second pair of leaves and begin to show signs of crowding in the box they must be moved on. There are two ways of doing this ; either they may be pricked out into boxes of the same size, allowing three or four dozen to a box, or they may be put out into beds where they can be watered and shaded for a few days until they have become settled. The boxes should be prepared much as for seed, but with the addition of a little well-rotted stable manure or leaf-mould that has been passed through a coarse sieve. The mixture should be very well firmed down, as much depends on this if the robust growth so much desired in a seedling is to be obtained. For pricking off, a wooden label is most useful; if it is inserted into the soil near the seedling the roots can easily be levered up without damage. Never should seedlings be pulled up between finger and thumb, as this will sorely damage the roots. Replant so that the lowest pair of leaves shows just above the soil; and be careful to see that the roots go well down to the base of the hole, and that the hole is well filled in, for if an air pocket occurs there the roots will wither and the seedling die.

Watering. Seedlings should be kept moist but not in a sodden state. Instead of constantly watering overhead with a rose, which must be a very fine one, it is far better in the early stages to put the box bodily into a bath of water 2 or 3 inches deep and let it remain there 10 minutes or so. The soil at the base will then get a thorough soaking and keep moist for days.

Planting out. Avoid planting out just after very heavy rain when the ground is sodden, for the soil will cake round the tender rootlets and impede growth. On the other hand, if planting has to be done when the soil is not thoroughly moistened, be careful to make the holes large enough to give the roots plenty of room; cover with a little soil and water well in before filling up with soil and firming.

Sowing Seed in the Open.—The site selected must be prepared by digging and raking fine until the earth is well pulverised. If sand is available it should be added at the rate of some 10 to 20 per cent. to make it porous and enable air to penetrate freely through it. If the soil is not made fine in this way, many of the seeds will fall down in between the clods of soil and will not germinate, and those that do come up will have their tender roots parched, as there will be no fine soil through which they can work and so obtain nourishment and moisture. Too rich a soil must not be used or the seedlings will become tall and straggly, instead of short and sturdy, which is the ideal at which to aim. The beds should be pressed down firmly and left to settle for a few days before seeding, and watered thoroughly if dry. Seed should be sown thinly in drills from 6 to 12 inches apart. Thick sowing means that the seedlings will be drawn up and sickly, while thin sowing secures short sturdy seedlings. When these show their second leaf thin out, and later put them into their permanent quarters. Some annuals give much better results if sown in the beds where they are to flower, so as to avoid any disturbing of their tender roots by transplanting. Amongst these are Godetia, Zinnia, Lupin, Balsam, Poppy, Cosmos, Clarkia, Mignonette, Phacelia and many others. With these either sow in circles or broadcast very thinly over the required area, and cover over to a depth of half an inch or so. When the seedlings are about 1 inch high a preliminary thinning out will make the final singling much easier, and at the same time assist the plants which are left by providing more growing room. Crowded annuals do credit neither to the grower nor to the plants themselves ; any lack of attention at thinning-out time is very soon apparent in their poor condition, and, later, in their very inferior show of bloom.

In watering seedlings care must be taken to see that the moisture gets to the roots of the plants, and is not confined to a mere sprinkling which only induces the roots to come to the surface ; a thorough watering encourages them to go deep into the soil and to escape the harmful influences of the hot sun and drying winds.

Period of Germination. This varies very much with the conditions ; fresh seeds germinate quicker than stale, and annual quicker than perennials. Seeds of shrubs and hard woody plants will sometimes take twelve months before showing life; seeds of bulbs are often very slow. Don't be in too great a hurry to turn out your seed boxes!

The Shade House. It is a fairly common and very wise practice to erect a shade house for the raising of flower seeds. This is quite a simple and cheap affair if one has a few wattle poles and americani cloth for roofing. Sawn timber makes a neater and more lasting job, of course, but is more expensive and is not necessary except for the staging. A useful size for a gardener wishing to raise plants for his own use only is a house measuring 12 by 8 feet, and not less than 6 feet high. This will give a staging 33 inches wide on either side of the house and a passage 30 inches wide down the middle. The staging should be made of sawn cedar timbers measuring 4 inches by 1 inch, raised on rough-cut poles to a convenient height above the ground, say from 27 to 30 inches. Be careful to get the staging quite level or much trouble will be found later when watering the seedlings.

The pitch of the roof must be arranged according as one wishes the rain to pass through the americani cloth or not. This is quite a debated point, some even going to the extent of oiling the americani to keep all rain out. The ridge and rafters can all be light wattle or eucalyptus poles, as straight as possible, and the lighter the better to minimise dripping; do not attach the americani to the rafters except at either end where they extend beyond the wall. It is a good plan to sew the edges of the americani strips together before putting them on the roof.

It is wise to enclose the house from the ground to the eaves with fine wire netting as a protection from birds, dogs, cats, and so forth; a door is necessary for the same reason. It is not advisable to put the house either under trees or within reach of their branches; and it is best to have it running from east to west. On no account choose a windy site for it.

Preparation of Flower Beds. It is always best when making a garden to spend some trouble in preparing the soil of a new flower-bed. With virgin land one can trust to the much-advertised fertility of the African soil, and after breaking up the ground and removing all the vegetation and roots sow the flower bed direct or put out seedlings in it. But this natural fertility only lasts for a year or two, and not indefinitely as is so often supposed. Flower beds should therefore be prepared before use on the lines laid down below under the next heading, and also in the chapter on Vegetables, with deep digging or, better still, trenching, and enrichment of the soil with manure before it is put back.

Plant Nurseries. One of the first things to do when starting a garden in East Africa is to choose a suitable situation for the nursery, preferably on slightly sloping ground ; this will necessarily depend upon the lie of the land. In the case of a town or suburban garden the water available will probably be only the bath or waste water from the house ; but this can be made to serve a good purpose provided care and thought are expended to minimise waste and employ the whole amount available in the most profitable manner. The water should be piped to the site chosen for the nursery, which should be at a lower level than the house and in some secluded spot. Here the beds should be made where plants that have flowered can be put away to dry off ; such as Lilies and Gladioli, which are unsightly in the front beds when they are over, and should be replaced by others that have been grown on elsewhere till nearly in blossom so that the garden can always be kept bright and full of flowers.

When making beds for the nursery a great deal of care should be taken in the first instance, and then the hard labour is at an end. The beds must be trenched, that is to say dug deeply, the top spit of soil being removed so that the earth below can be loosened to a further depth of 6 or 8 inches ; rotted manure or well-matured leaf-mould must be incorporated with the top soil before it is returned. The bed should be from 3 to 4 feet wide, and shaded ; a perfectly efficient shade can be obtained by constructing a frame of unsawn wood, wattle or eucalyptus poles being used as follows. Put in upright posts at 7 feet intervals on either side of your bed, and on the top of these nail light horizontal poles on each side from one end to the other. Next tie small sticks across, about 4 inches apart ; grass or matting, whichever is preferred, can be fixed over these cross-pieces.

A small furrow must be arranged along the upper side of the bed with a slight fall so that the water from the pipe flows along quite slowly and the bed is moistened from below. Once any system of irrigation is commenced, however small, it will be found so interesting and efficacious that the gardener will quite easily work out the details for himself, and no further instructions are necessary. The nursery should contain prepared beds without shading, as well as the shaded beds described above ; but all should if possible have the benefit of the water from the pipe.

The above remarks apply only to gardens where there is no stream or swamp in the near vicinity, and the nursery is dependent on waste water from the house. In many cases, however, it will be possible to arrange for a permanent supply of water from a dam or a water-furrow. Everything is so dependent on the particular lie of the land in such cases that no definite rules can be laid down. Arrangements must be made whereby the water will gravitate to the place where it is required for the purpose of irrigation, and the nursery beds must be prepared as described above ; the details in each case are only matters of common sense and some imagination. When a large quantity of water is being dealt with a return furrow must be dug to conduct the surplus water back into the stream or elsewhere, so that the nursery may not be flooded.

Excess of water is even more dangerous to plants than drought, and the question of drainage during the rains ought to receive full consideration in the planning of a nursery or a garden which is to be under irrigation.

If economy has not to be practised and pipes instead of furrows can be used to carry the water, the whole matter is very much simplified. But when cultivating swamp land it should be borne in mind that the soil is usually sour and therefore requires a lot of working, and that a plentiful dressing of lime will expedite the sweetening of the land. The best results may not be obtained immediately, but once the swamp nursery or garden has been properly started the results will be so surprising that there will be no regrets for the amount of work expended.

CHAPTER V

THE PROPAGATION OF PLANTS

Propagation by Seed—Vegetative Propagation—Division—Separation—Layering—Cuttings—Grafting and Budding.

THE propagation of plants, which is one of the most important operations in gardening, is effected by two chief methods—propagation by seed and propagation by vegetative parts. To the majority of amateur gardeners the former method seems the easier. It is not, however, the quickest, and other methods are easily learnt and proficiency acquired with practice, thereby adding a great deal to the interest of gardening.

Propagation by Seed. To ensure a good germination it is essential that the soil is in the right condition for sowing the seed. The preparation of the bed or box has been given in another chapter (page 35) ; suffice it to say that the soil must be porous to allow of good drainage, neither too wet nor too dry, and well firmed after the seeds are sown. To test the condition of the soil press some earth from the top of the bed or box in the hand. Should the ball thus formed fall to pieces, the soil is right for planting. Should it stick to the hand, or crumble to dust, it is too wet or too dry. The bed or box should be watered before, not after, sowing, otherwise a cake which excludes air will be formed on the surface of the soil. Never sow thickly, but think of the size of the seedling to appear. Thus the larger seeds will be sown individually, medium sized seeds thinly, from the packet, and very small seeds mixed with sand or fine earth to ensure even distribution.

A general rule for seeds is that they should be buried to a depth of two or three times their diameter. There are exceptions with peculiarly fine seeds such as Begonia, Gesnera, Gloxinia, etc., which should not be covered but just firmed on to the surface of very fine soil. A piece of glass, which must be wiped daily, covered with brown paper should be placed over the pot or seed-box. Another exception is with the seeds of short-lived plants, such as garden and flowering Peas, Lettuces, Clarkia and other annuals. These should be sown at a depth of five or six times their own diameter. When seeds are sown direct in their flowering quarters they should all be deeper as a protection from weather, birds and insects. In these situations it is better to thatch the ground to prevent wash, but such thatch must be removed as soon as germination begins. In all cases the sowing of seeds broadcast should be avoided, as the weed growth is very much greater in this country than in Europe. Many seeds usually so treated can be transplanted in cloudy weather. Those with tap-roots can be sown in banana-leaf baskets, which are slit open and planted direct when the seedling is large enough.

The germination of seeds varies considerably both in the length of fertility and the time taken to germinate. It is better to sow seeds which ripened the previous year, except in certain cases where fertility is known to be short-lived as with Gerbera, Leek, Onion, Delphinium, Parsnip, etc.

Vegetative Propagation

The vegetative propagation of plants is carried out by the following means :—by the division of the plant ; by the separation of detachable parts; by layers ; by cuttings; and by grafting and budding.

Division. The means employed to increase most herbaceous plants is division. The plant is lifted when dormant, preferably shortly before the beginning of the rains. It is then quite an easy matter to pull or cut the clump apart, and in most cases the natural divisions will be apparent. If the divided portions have no roots, care must be taken to shade and avoid excessive moisture till rooting has begun. Strawberries are usually propagated by runners, but some varieties make bushy plants which must be divided to increase the supply. Where runners are taken it must be remembered that those nearest the parent plant are the most prolific.

Separation. The bulbs of some varieties of Liliums may be increased by removing mature scales and planting these in light soil. Other Liliums make bulblets up the stems, some Alliums in the flower heads. Propagation can be effected by all of these. Bulblets formed round the parent bulb are the readiest means of increasing bulbous plants, though many are easily raised from seed where quantity is required.

Layering is the term applied to the process of rooting branches or stems while still attached to the parent plant. It is used with plants and trees which do not take readily from cuttings. Some subjects layer themselves naturally, as Pentstemon, Verbena, Maurandia, etc., which root wherever a stem lies on the damp earth. To layer a branch, take off all buds except those required for the new plant. Cut a notch on the under side, below a bud, and wedge this open with a stone, fix the branch to the earth with pegs or stones and cover with soil which must be kept watered moderately. When roots are well formed, cut off the branch behind the layer and remove to its own position. ‘ Air layering ’ and ‘ marcottage ’ are so seldom required in the ordinary course of gardening that it is not necessary to describe these procedures here.

Cuttings. When preparing to take cuttings several things must be borne in mind if success is to be achieved. Broadly speaking, cuttings are of hard wood or soft wood, and these require different treatment ; but whatever kind are to be taken, the medium in which they are to be struck should be considered. Many cuttings take quite well just pushed into any part of the garden, but this is certain failure with the majority. Another point to be borne in mind is the season at which they are taken. It is obviously useless to take cuttings at the beginning of the rains, except where a long wet season is usual, if they are to become established plants capable of surviving the subsequent drought before that sets in. It is therefore imperative to put aside boxes or shaded beds for the purpose of rearing plants from cuttings, ready to plant out when the wet season begins. A great deal of water is not required to bring on the cuttings for an average garden.

To take a cutting of firm wood from a shrub, cut through a branch between two buds, or preferably break one off with a heel. To prepare it a sharp knife must be used to pare away the wood of the heel and leave a slanting surface. Four or five buds should be left upwards and the branch again cut through. Several cuttings can usually be taken from one branch, each having a diagonal cut at the base to increase the rooting surface, and about four buds above. Should there be a great many buds the excess should be removed. The diagonal cut should be through the base of or immediately below a bud.

Firm wood cuttings may be rooted in a deep box or seed-bed of fine soil, but good drainage is essential. Having dibbled a hole, the base of which must be of the same size as the cutting, drop in a little sand or charcoal, place the cutting so that three of the buds are below the soil, and firm in well. The lower leaves should be removed and the upper ones cut in half to lessen evaporation. Hard wood cuttings require more air and moisture than those of soft wood, and should therefore be planted separately. Most of the hard wood cuttings required in the average garden need no more than a well drained bed, but if a box is used, a good layer of crocks or stones must cover the drainage holes in the bottom. This layer should be covered with charcoal before putting in the mixture of fine earth and sand. Whether box or bed is used shading is essential.

'Soft wood' referred to for cuttings is not green sappy growth, but wood which will snap when bent sharply. Such cuttings should be taken in the same way as hard ones, but they require greater heat and less ventilation and moisture. As damping off is the usual difficulty the watering should not be left to native labour. Having taken the cuttings, leave them to dry for twenty-four hours before planting in an only fairly damp medium, and do not water for another day.

Cuttings which are notoriously difficult to strike meet with a much greater chance of success when grown in a propagating frame. There are several elaborate designs, but a simple and adequate one for the amateur is made as follows :—

Put a tight-fitting, preferably hinged, glass lid on to the sides of a wooden frame not less than 1 foot deep. Dig a hole 2½ feet deep of the same dimensions as the frame. The following layers must then be put into the hole: 1 foot rubble or stones, 6 inches charcoal covered with a layer of leaves, then sand till it is 2 inches above ground level. Stand the frame over this. It is important that the sand be free from fungus, and an easy way to sterilise it is to boil it in buckets with very little water, which must be poured off after boiling. Cool the boiled sand for about half an hour before filling the frame, then close the lid and leave for a day or two. The frame should not be opened until the sun is well up, and tepid water only be used for watering. The ventilation required cannot be laid down as it varies with the variety of cuttings.

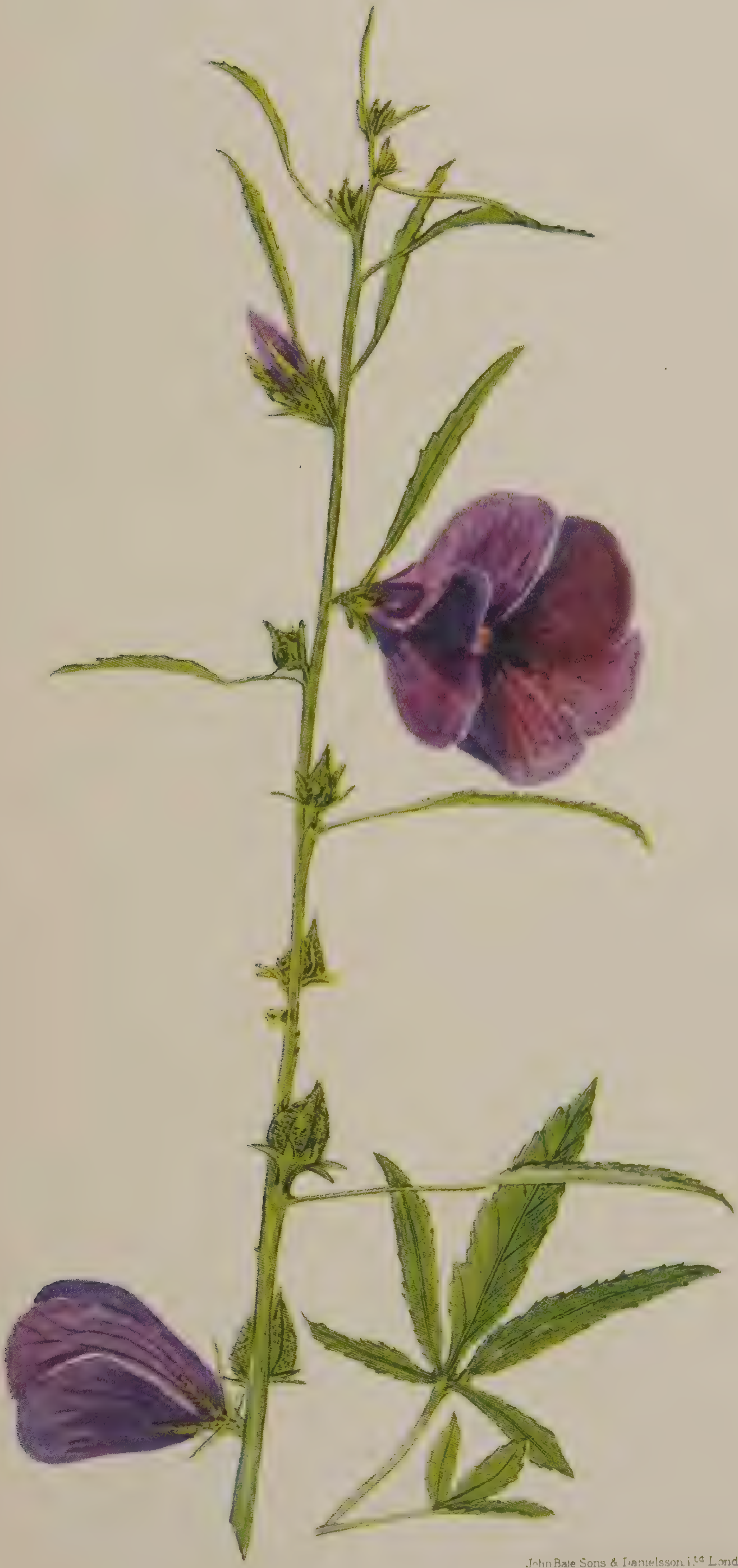
Leaf cuttings are the means whereby some plants are propagated. The leaf, which must be a mature one, is weighted down on a fine bed of soil after the underside of the midrib has been cut in several places. Some leaves will grow from the leaf-stalk, which is inserted like a cutting and half the leaf removed to lessen evaporation.

Succulent plants take readily from cuttings which may be kept dry for a few days before planting. Unlike other cuttings they should not be shaded, and very little moisture is required. Cuttings of aquatic and semi-aquatic plants usually root easily in moist earth under shade. Cuttings strike more freely when inserted in porous pots.

Grafting and Budding save much time where many trees must be propagated. They are used where a particular variety will not come true from seed, will not take freely from cuttings, or will not set seed in the country in which it is required to grow. The habit of the tree is changed according to the stock on which it is grafted, thereby greatly enlarging the conditions in which a certain tree will grow. The principle is to insert a piece of branch (grafting), or a bud with little wood (budding) into the selected stock. There are many methods employed to achieve the growing together of the cambium, or tissue under the bark, of the cutting (scion) and the stock.

Budding and grafting do not usually come within the range of the amateur gardener, and much modern literature is available on the subject, so it is not proposed to go more fully into the matter here.

A method of propagation used in nature is that of root suckers. Though it may be used successfully with certain shrubs and herbaceous plants, it is not generally to be recommended. Plants so propagated are apt to reproduce the habit excessively when they reach maturity.



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HIBISCUS CANNABINUS.

See page 104.

CHAPTER VI

ANNUALS

Introduction—Alphabetical List of Species.

Almost all the annuals that one is familiar with in England grow well in one part or another of East Africa, and although the rate of growth and the time of flowering vary with the altitude, at any rate in the highlands annuals can make one's garden gay with colour for the greater part of the year.

They require, however, a certain amount of forethought and preparation to get good results, and where there are two rainy seasons this means seed-sowing twice a year; but at some altitudes certain annuals will flower best when sown before the short rains and others when sown after them. Where there is a single long rainy period seeds should be sown from April to August, and flowers such as Schizanthus that suffer from heavy rain, should be planted out from seed-beds so as to flower in September.

Practically all small seeds must be sown beforehand either in seed-beds or boxes (see Chapter IV). Large-seeded annuals can be sown where they are to be grown, and so also those that do not transplant well, such as Poppies and Ursinia. Many kinds will, of course, seed themselves and if allowed to will flower later, making a useful succession to those sown in boxes and beds and planted out.

Seeds vary as to the length of time they take to germinate and grow in boxes and seed-beds, and in the following list the approximate length of time is given; but due allowance must be made at the higher altitudes where the mean temperature is lower and the germination and growth will be slower.

The ground where annuals are to be planted out must be prepared some time before planting. Although they will grow in ordinary garden soil, the plants will produce better blooms and resist heat and drought more effectually if the ground has been well dug and manured.

When the time comes to plant out, all seedlings in boxes and beds should be well watered, so that each plant may be lifted with a ball of soil and the roots disturbed as little as possible. Planting should be done in dull weather ; but if this is not possible, shade the roots of the lifted plants from sun and wind while carrying them from seed bed to permanent quarters. The ground in the latter must be wet but not over-watered, as roots require a damp not a muddy soil to settle in, and the holes should not be made until the plants are actually ready for planting.

Except for tender plants, shading will not be necessary if the rains continue daily ; but where there is any chance of a very hot sun or a drying wind shading is advisable until the plants are established.

When bedding-out the space to be given between the seedlings naturally depends on the growth and height of the different kinds of plants ; Antirrhinums and Scabious, for example, should be put in from 18 inches to 3 feet apart, and dwarf plants, like Portulaca, a few inches. Seedlings that have been sown in the open border must be thinned out to allow those left to have light and air enough to make good growth.

The roots of the transplanted annuals must not be allowed to get dry, and watering should be done in the evening or early morning ; one good soaking is better than two sprinklings. Garden boys are very much inclined to think they have watered when they see the surface of the soil wet, but this sprinkling evaporates very quickly and the roots get no benefit.

Mulching is advisable in the hot weather, and this can be done with well-rotted stable manure, cedar-wood dust, lawn clippings, or any other substance that will let the water through and yet be thick enough to keep the ground cool and moist.

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Staking should be carefully done. In staking hardy plants, place a stake in the middle and then loop the main shoots by means of twine or bast to it, the smaller shoots again being looped to the larger ones so as to give a natural appearance to the plants. Where the shoots are narrow and slender it is best to surround the plant with three stakes and run circular strands of twine at even distances to enclose the shoots. Medium-sized annuals may be supported by placing a few twiggy branches among them.

All annuals will continue flowering longer if their seed-pods are removed, and at the higher altitudes the slow growing annuals that have been sown for the long rains in April, but do not flower till September or October, can generally be relied on to flower almost right through to the next long rains if the seed-pods are removed and the plants are kept well trimmed. It will be found that some annuals will not flower at certain altitudes and yet will flower profusely in gardens only a hundred feet or so higher. In the cold season, annuals such as Portulaca and Nemesia may flower badly or not at all, and yet will do well in the hot months.

The following annuals do well at all altitudes in the highlands unless it is stated otherwise. The coastal area is not considered in this list.

Alonsoa. Height 1½ feet. Flowers scarlet. Sow in boxes 2 to 2½ months before the rains; may also be sown in the open, preferably before the long rains.

Amaranthus (Joseph's Coat). Height 2 to 6 feet. Ornamental foliage, flowers purple and crimson.

Antirrhinum (Snapdragon). Height 1½ to 3 feet. Though perennial is best treated as an annual for good blooms. Sow thinly in boxes three months before the rains, and prick out, when four leaves have formed, into beds or boxes. Pinch out the tops when about 3 inches high to encourage bushy growth.

Balsam. See IMPATIENS below.

Brachycome iberidifolia (Swan River Daisy). Height 6 inches. Flowers a mixture of colours from dark blue to almost white, with varying centres. Best sown where it is to flower; cover the seeds lightly with soil. Better above 6,500 ft.

Browallia. Height ½ to 2 feet. Flowers blue. Sow one and a half to two months before the rains, best before the short rains, and plant out. Seeds itself.

Calceolaria (Slipperwort). Height 1 to 2 feet. Flowers yellow. At most altitudes does fairly well only.

Calendula (Scotch Marigold). Height 1 to 3 feet. Flowers orange and lemon. Sow in seed-bed a month before the rains, or in the open where they are to flower before the long rains. Plants will last a year and flower for two rainy seasons except in dry districts.

Calliopsis. See COREOPSIS below.

Callistephus (Chinese Aster). Height 6 inches to 2 feet. Colours various. Sow in boxes or beds two months before the long rains, and plant out early to get a good start. Likes good well-manured soil. Best grown from Australian or local seed. Grows only fairly well in some parts of East Africa.

Campanula Medium (Canterbury Bells). Height 2½ feet. Flowers blue, white, violet and rose. Biennial. Sow in boxes or beds two months before the rains. Bloom in nine months after sowing and will seed themselves. Must be watched when planted out, as in dry weather they are apt to dry off.

Celosia (Cockscomb). Height 1 to 2 feet. Colours various. Sow in boxes six weeks before the rains.

Celsia. Height 3 feet. Flowers yellow. Biennial. Fair from 5,000 to 6,000 ft., but probably does better higher up as there are indigenous species found above 7,000 ft.

Centaurea Cyanus (Cornflower). Height 1 to 2½ feet. Flowers blue, mauve, white and pink. Sow in the open at the beginning of the long rains.

C. imperialis hybrids. Height 1½ feet. Flowers red, heliotrope, rose, white and yellow. Sow in boxes six weeks before the rains, or in the open when the rains begin. Bloom freely and are useful for cuttings.

C. moschata (Sweet Sultan). Height 2 feet. Flowers purple, white and yellow. Treatment is the same as for *imperialis*.

Chrysanthemum. Annual. Height 2 feet. Flowers various shades yellow, crimson and white. Sow where they are to flower and thin out the seedlings. Seed themselves very freely.

Clarkia. Height 1 to 3 feet. Flowers rose, white and purple. Sow in the open and thin out to 6 inches apart when 3 inches high.

Coreopsis (Tickseed). Height 6 inches to 2 feet. Flowers yellow and crimson. Sow where they are to flower at the beginning of the long rains.

Cosmos. Height 1 to 2 feet. Flowers rose, white, crimson and pink. Sow where they are to bloom. Spreads very rapidly if allowed to seed.

Cynoglossum (Hound's Tongue). Height 1 to 2 feet. Flowers blue and pink ; a dwarf for edging, white. Biennial, but best treated as annual. Sow in boxes or beds six weeks before the rains. *C. amabile* is the best.

Delphinium 'Blue Butterfly.' Height 1 foot. Flowers blue. Sow in boxes two months before the rains, and preferably before the long rains, when the plants will flower again in the following short rains at higher altitudes or where they are kept watered.

Dianthus (Chinese or Indian Pinks). Height 1 foot. Flowers pink, white, red. Sow in boxes or beds two to two and a half months before the rains. After planting out will flower for two rainy seasons. May also be sown where they are to flower.

Dianthus barbatus (Sweet William). Biennial. Flowers red, pink and white. Sow in boxes or beds and transplant during the rains. Likes partial shade, but spreads and wants frequent dividing and transplanting. Often takes two years to flower and then only blooms fairly well at lower altitudes, but does well at 8,000 ft. and over.

Dianthus 'Sweet Wivelsfield.' Height 1 foot. Flowers of various colours ; is a cross between *Dianthus Allwoodii* and Sweet William. Flowers freely, but is not so effective as the Chinese or Indian Pink.

Diascia. Height 9 inches. Flowers pink and coral-like. Good for dwarf borders.

Didiscus (Blue Lace Flower). Height 1 to 1½ feet. Flowers light blue. Sow in boxes six weeks before the rains, or in the open where they are to flower.

Dimorphotheca. Height 9 inches. Flowers salmon, orange and white with blue zone. The Cape Marigold is *D. pluvialis.*

Echium (Viper's Bugloss). Height 1 to 4 feet. Flowers red, violet, and purple. Seeds itself.

Eschscholtzia. Height 1 foot. Flowers yellow, orange, and red. Sow where they are to flower at the beginning of the long rains.

Exacum affine. Height 1 to 2 feet. Flowers lilac and purple. Biennial. Agreeably scented; flowers in six months.

Gaillardia. Height 1½ feet. Flowers of all shades of brown, maroon and golden yellow. Seeds itself most profusely. The small double variety is very useful for cutting as it continues to flower when most annuals have finished. Sow in boxes or in flowering positions.

Gilia. Height 9 inches to 3 feet. Flowers red, white, yellow or violet. Sow in beds or boxes six weeks before the rains, or in the open when the rains begin. Seeds very easily and stands drought well, blossoming when there are few other flowers out in the garden.

Godetia. Height 1 to 2 feet. Flowers crimson, white, pink and red. Sow either in boxes or in the open where they are to bloom. Thin out as soon as they are large enough to handle.

Gypsophila. Height 1 foot. Flowers white. Sow in the rains where it is to bloom.

Helianthus annuus (Sunflower). Height 3 to 5 feet. Flowers yellow. Sow where they are to bloom.

Helichrysum (Everlastings). Height 2 to 4 feet. Flowers white, crimson, yellow or rose. Seed themselves and spread rapidly.

Hieracium aurantiacum (Hawkweed). Height 1½ feet. Flowers yellow.

Iberis (Candytuft). Height 6 inches to 1 foot. Flowers white, lilac, and red. Sow where they are to flower and thin out.

Impatiens (Balsam). Height 1 to 2 feet. Flowers of various colours. Sow in the open. Seeds itself, and likes well-manured soil.

Ipomoea purpurea (Convolvulus, 'Morning Glory'). Climber. Flowers blue. Sow where it is to be grown. Seeds itself.

Jacobaea (syn. *Senecio*). Height 1 foot. Flowers red or puce. Sow in boxes two months before the rains.

Larkspur. Height 1 to 3 feet. Flowers pink, blue, and white. Sow where they are to flower. Sometimes difficult to transplant, but to get a succession of blooms it is advisable to sow in boxes or beds six weeks before the long rains and to plant out later. Do fairly well at 6,000 ft.

Lathyrus odoratus (Sweet Pea). Height 6 to 10 feet. Flowers pink, red, white, blue and mixed. Sow where they are to bloom, but the ground must first be well dug. Make a trench at least 2 feet deep and 3 feet wide, put a layer of green weeds or grass cuttings at the bottom, then a layer of soil and a good layer of manure, and fill in remainder of the trench with good soil. Sweet Peas from English seed make a tremendous number of side shoots, but Australian seed runs to one stem only and does well at most altitudes. At higher altitudes, 7,000 ft. and over, seed may be sown in boxes and planted out in the rains; so treated they will be found to flower some weeks earlier than those planted in the open. Do only fairly well below 6,000 ft.

Lavatera. Height 3 feet. Flowers rose and white. Seeds itself. Does only fairly well at 6,000 ft.

Leptosiphon. Dwarf. Flowers yellow, lilac or white. Suitable for massing and edging; very delicate and charming.

Leptosyne. Height 1 to 2 feet. Flowers yellow. Sow where it is to flower.

Linaria (Toadflax). Height 6 inches to 1 foot. Flowers white, purple and yellow. Sow where it is to flower and thin out the seedlings.

Linum (Flax). Height 1 foot. Flowers of various colours. Sow in the open in the rainy season.

Loasa. Height 1 to 2 feet. Flowers white, yellow or red. Leaves furnished with stinging hairs, poisonous.

Lobelia. Dwarf and suitable for edging. Flowers blue or white. Sow in boxes six weeks before the rains, or take small rooted side-shoots from plants that have already flowered. Does fairly at 6,000 ft.

Lunaria biennis (Honesty). Height 2 to 4 feet. Flowers purple or white. Biennial.

Lupinus. Height 1 to 1½ feet. Flowers blue, white or yellow. Sow in the open where they are to flower at the beginning of the long rains. Will flower twice if cut back.

Martynia fragrans. Height 1 to 2 feet. Heart-shaped leaves, large purplish-pink flowers with a scent unpleasant to many, seed-pods like sharp curved horns. Sow in box and transplant.

Matthiola (Ten Week and Brompton Stocks). Height dwarf to 2½ feet. Sow in boxes or beds a month to six weeks before the long rains, and plant out at the beginning of the rains to get a good start. They are tap-rooted and must be carefully transplanted. May be sown in banana-leaf pots and planted out in these so that the roots need not be disturbed. Like a rich well-manured soil and plenty of moisture. Leaves are often attacked by small caterpillars, which may be hand-picked or the leaves may be sprayed with a nicotine mixture, using a fine syringe.

Matthiola bicornis (Night-scented Stock). Height 1 foot. Small lilac flower that opens in the evening and gives a sweet perfume. Sow where it is to flower, and cover the seeds lightly with soil.

Mimulus (Monkey Flower). Height 6 inches. Flowers yellow or crimson. Sow or plant out in moist ground near water. Will do well with roots in water. Grows fairly well at 6,000 ft.

Mina lobata (syn. *Ipomoea versicolor*). Climber (see page 125). Flowers red and yellow. Seeds itself.

Nemesia. Height 6 inches to 1 foot. Flowers white, yellow, scarlet or blue. Sow either in boxes six weeks before the long rains, or where it is to flower. At higher altitudes sows itself freely, growing only fairly well at 6,000 ft., where it is the better for light shade.

Nemophila (Californian Bluebell). Dwarf, 6 inches. Flowers white, blue or purplish brown. Sow where it is to flower. Suitable for edging.

Nicotiana (Tobacco). Height 3 feet. Flowers white, pink, lilac and crimson. Sow in boxes or beds before the rains, or where it is to flower when the rains commence. It really becomes a perennial in Kenya, with a spreading root-system that forms new plants at a distance from the original one.

Nigella (Love-in-a-Mist). Height 1 to 1½ feet. Flowers blue. Sow in boxes and transplant, or sow in the open border at the beginning of the rains.

Oenothera (Evening Primrose). Height 3 feet. Flowers yellow. Biennial. Sow in the open border. Seeds itself.

Papaver (Poppy). Sow where they are to flower and thin out ; they do not like transplanting.

Shirley Poppies are a little difficult to grow, but should be sown in boxes and transplanted at the beginning of the long rains.

Perilla. Height 1 to 3 feet. Foliage plant with variegated leaves.

Petunia. Height 1 to 1½ feet. Flowers violet, mauve, white, pink, and single or double. Sow in boxes, or in the open where it is to flower. The commoner singles seed themselves, but the deep violet and the doubles require more attention.

Phacelia campanularia. Height 9 inches. Flowers deep blue and bell-shaped. Sow in boxes and transplant. Not so hardy as *P. congesta*, height 12 inches, with mauve flowers like heliotrope, which seeds itself.

Phlox Drummondii. Height 6 inches to 1 foot. Flowers crimson, white or pink. Sow in boxes or beds six weeks before the long rains. Nip off the top of the main shoot to induce bushy growth before planting out. Seeds itself very easily. Grow in masses or in between taller growing plants.

Portulaca. Height ¼ to 1 inch. Flowers of various bright and gaudy colours. Sow in boxes two months before the short rains. This dwarf plant is suitable for edging, and does well in dry weather and on poor and rocky soils.

Reseda odorata (Mignonette). Height 1 to 2 feet. Sow in boxes or in the open border. Will propagate itself if allowed to seed. Likes lime in the soil.

Rhodanthe (Swan River Everlasting). Height 1 to 1½ feet. Flowers white, crimson, rose, yellow or purple. Cover seeds lightly with soil.

Salpiglossis. Height 2 feet. The flowers have dark veins on white, crimson, yellow, orange or purple grounds. Sow in boxes from two to three months before the rains, and prick out into boxes or beds when three leaves have formed. Apt to damp off if over-watered. Transplant to permanent quarters when the rains are well established. Does fairly well at 6,000 ft.

Scabious. Height 1 to 5 feet. Colours various. Biennial, but best treated as an annual. Sow in boxes or beds six weeks before the long rains. Plant out 2 to 3 feet apart. Will flower in from six to nine months' time. At the higher altitudes will flower a second time if cut back.

Schizanthus. Height 1 to 2 feet. Dr. Badger's hybrids are much stronger plants and produce larger flowers than any other variety. Sow thinly in boxes six weeks before the long rains, and prick out when 1 inch high. Where there is a long rainy period plant out in August, as the plants suffer in heavy rain.

Silene (Catchfly). Height ¾ to 1½ inches. Flowers red and rose; suitable for edging. *S. Fortunei* grows 12 to 14 inches high, stands drought well, and is always in bloom.

Tagetes erecta (African Marigold). Height 2 feet.

Flowers lemon or orange. Sow where they are to flower. Seed very easily. Like a rich soil.

Tagetes patula (French Marigold). Height 2 feet. Flowers yellow. Sow in the open. Will flourish and seed themselves on comparatively poor soil.

Tagetes signata *var.* **pumila.** Height 6 inches. Flowers yellow. Good for edging. Seeds itself.

Tithonia. Height 3 to 5 feet. Flowers orange tango. Sow in the open at the beginning of long rains. Will seed itself.

Tropaeolum majus (Nasturtium). Height, Dwarf or Tom Thumb varieties, 9 inches. Flowers crimson, scarlet or yellow. Sow in the open ; grows best in poor soil, otherwise goes to leaf. Also usable as a climber.

Ursinia. Height 1 to 1½ feet. Flowers orange or yellow with a purple zone round the centre. Sow in the open. Does not transplant well. Flowers for a long period and seeds itself.

Venidium. Height 2½ to 3 feet. Flowers large, orange and yellow. Sow where it is to flower. Give plenty of room to spread ; the main stem can be pegged down to allow the side shoots to develop.

Viola. Dwarf, height up to 6 inches. Flowers mauve, purple, white. Sow in boxes and transplant. Likes partial shade and plenty of water. Also may be propagated by division and cuttings.

Viscaria. Height 1 foot. Flowers purple, white, pink or blue. Plant in masses.

Zinnia. Height 1 to 2 feet. Flowers yellow, orange, rose or purple ; sow where they are to flower.

CHAPTER VII

PERENNIALS

Introduction—Alphabetical List of Species.

The following list and remarks on the perennial plants grown in East Africa and Kenya in particular should prove of help to those who are starting a garden in the above territories. Great care has been taken to obtain information from the different localities, so that it will be easily seen what grows at the various altitudes, with their different rainfalls. The pioneers of horticulture in East Africa have had much to find out, and there is still an open field, but a good deal has been done and certain results obtained; and those who are strangers to the country should derive much assistance from the work of the enthusiasts who have arrived at the conclusions set down in the various chapters of this book.

The treatment of perennials in a tropical country is necessarily very different from that in England, where the resting time of the plants is in the winter, and probably lasts some five months when the ground is cold and often frostbound. In Kenya the only resting period for the same plants is at a time when the weather is dry and the sun at its hottest, and the soil is often so hot that one's feet are burnt through thick leather soles.

There are ways by which these conditions can be somewhat mitigated, primarily by heavy mulching, which is to be recommended in every way, as the goodness of the soil is preserved by shielding it from the fierce rays of the sun, and the roots of the plants are kept fairly cool. But many people do not like to see their beds and borders covered with litter, and to such we should advise either a selection of perennials that will survive the hot season without the care above mentioned, or the removal of the plants to a situation near their stream where a nursery garden will doubtless have been made. In another chapter this question of nurseries is thoroughly gone into (page 40); and it is soon realised that only in exceptional circumstances, where a stream or furrow goes through the garden near the house, can it be hoped to keep a continuous mass of colour in the borders without a stock of plants which can be grown in a nursery more or less independently of climatic conditions.

For cut flowers also we have to depend on our nursery gardens, where water must be available in large quantities and a system of irrigation arranged. Dwellers in temperate climes find it difficult to realise that practically all the perennials that flower in the summer and autumn in England are easily grown in highlands on the Equator, and in spite of the different conditions under which they are cultivated may produce an abundance of flower, while the plants attain maturity in a considerably shorter space of time. Curiously enough many of the spring flowers also flourish, particularly in the higher altitudes; and from all the information gathered from many localities it seems safe to conclude that there is hardly a flower listed in a seed catalogue that has not been successfully grown by some patient horticulturist in some part of the Colony. In the detailed list of the various herbaceous plants given below it should be noted that unless some special mention is made of a particular district where the plant is known not to thrive, the conclusion should be that it grows anywhere in the highlands. The tropical area has its own flora quite distinct from that of the higher parts of East Africa.

Acanthus. *A. mollis* (syn. *A. lusitanicus* and *A. latifolius*), a very handsome plant for the shade, or near water. Large rhubarb-like leaves and tall spikes of pale purple flowers. Seed.

Achimenes. A greenhouse plant in England, has been grown with success in Kenya. The flowers are of the richest colours and well repay the care required to produce them. They must have moisture, and do better in the shade than exposed to the full rays of the sun. Propagated by cuttings or raised from seed.

Agathaea caelestis. A charming little daisy-like flower of a particularly pretty shade of blue. Height from 12 to 18 inches. Very easy to grow in any good soil. Can be raised from seed, or propagated from a division of the roots.

Agave. *A. rigida* var. *sisalana* is very well known in Kenya by the simple name of 'Sisal,' and is hardly suitable for garden use, though often used as a so-called boundary hedge; but there are many others which are more ornamental, a well-known species being *A. americana* var. *variegata*, with striped yellow and green leaves. They are all too big for small gardens. Bulbils or offsets.

Alonsoa. This is usually looked upon as an annual, but in Kenya it is unquestionably a perennial. Is practically always in flower and has considerable drought resistance. The flowers of *A. linifolia* are scarlet with a pretty light foliage, quite unlike anything else, easily grown from seed; while *A. Warscewiczii* has flowers of a richer scarlet with deep green foliage and a smaller and more compact habit of growth. Seed or cuttings.

Althaea. See HOLLYHOCK below.

Anchusa. The perennial varieties of this beautiful blue flower have not done well when they have been tried, except at 10,000 ft. when they were really good. In the ordinary garden they refuse to flower. Seed.

Angelonia angustifolia. Has not been grown in many East African gardens, but is both easy and charming. Flowers blue and mauve in upright spikes. Height 1 to 2 feet. Seed.

Antirrhinum (Snapdragon). Dealt with among the Annuals (page 51); though of a perennial habit, these excellent plants are far better treated as annuals, and new seedlings should be planted out each season.

Aquilegia (Columbine). This lovely flower is easily raised from seed; should be planted under light shade, does best over 7,000 ft. Seed.

Arctotis. There are many varieties of this very hardy plant. *A. grandis*, a daisy-like flower, pale mauve with a dark centre, is a pretty thing, but it has the great disadvantage of closing at night. It is very easily grown and seeds itself everywhere. There is a dwarf species from South Africa of various colours, pink, orange, and almost brown. These flowers self-hybridise, and some of the results give flowers of most unusual colours. Raised from seed or propagated by root division.

Argemone grandiflora (Mexican Poppy). This is a beautiful plant bearing lovely flowers. The foliage is of a silvery green, and the flowers white of a silken texture, anthers golden. Grows to a height of 4 or 5 feet and is practically always in flower; no special treatment is required. Is easily raised from seed and well worth its place in the border.

A. mexicana is yellow flowered, and the rare *A. rosea* a beautiful shade of wine red. Seed.

Asparagus. There are many indigenous to Kenya, including *A. plumosus*, the English greenhouse foliage variety. Some of them are very lovely when in flower. Seed.

Aster (Michaelmas Daisy). This does well in most parts of East Africa; there are many varieties, and these flowers have been very much improved during recent years. It is now possible to get seeds of plants of various heights, and there is a large range of colours, principally of pinks, mauves, purples, etc. *A. subcaeruleus* is a most useful and ornamental plant. The flowers come away from their foliage and are borne in upright clusters on a stem 18 inches high. Colour a particularly lovely shade of mauve; a hardy plant always in flower. Can be raised from seed or propagated by division of roots.

Balsam (*Impatiens*). Many varieties of balsam are to be found in the forests or other damp places in Kenya. Several have become garden subjects and are well worth growing.

Begonia, fibrous rooted. These grow easily, either in a shady place in the garden or on the verandah. There are some very lovely varieties; and no Kenya garden is complete without these very ornamental plants which vary from very tall, 8 feet high species, through the *B. Rex* varieties, with their coloured foliage, to the small *B. semperflorens* garden varieties. Very easily propagated from cuttings, and even a leaf planted in damp soil will put out roots. Can also be raised from seed.

Bellis perennis. The common Daisy. This grows quite easily, and so does the garden variety, double, red and white, which has now been made into a most ornamental addition to the low-growing flowers for the front of a border. Seed or division.

Browallia. The perennial species, *B. speciosa*, is a most beautiful plant for a shady position, with large deep violet flowers. A profuse bloomer and nearly always in bloom. It is grown from seed, which is not always easy to germinate.

Bryophyllum calycinum. A curious erect succulent plant with panicles of red dependent flowers, and the happy power of growing from the fallen leaves which root and make little plants all round their edges.

Cactus. This generic term is popularly applied to all the different members of the very large Cactaceae family. They are nearly all prickly plants of rather forbidding appearance, but bearing periodically large and beautiful flowers. The *Opuntia*, or prickly pear is well known; and the large genus of *Cereus*, with its tall heavily armed growths like prehistoric battle-clubs is also often seen. There are very many species, large and small, of the general appearance of hedgehogs, and many of them do well in Kenya. A hot dry bank or border with poor soil may be made interesting and amusing by a collection of these plants. Seed and offsets.

Canna. The most decorative flower in the Kenya gardens. See page 154.

Carnation. The carnation, *Dianthus caryophyllus*, can be grown very easily in practically all parts of Kenya, though undoubtedly finer blooms are produced in the higher altitudes, where the plant is of more sturdy growth and far less trouble is necessary for the production of good flowers. It is difficult to say what particular soil it prefers, as it thrives in such a variety of different parts of the country, but good drainage is an essential, and sand and grit are unquestionably a help. Can be grown from seed, but the propagation from cuttings is a simple matter, as provided air is excluded from the box in which the cuttings are planted by means of a sheet of glass, there should be very few failures; indeed, Carnation cuttings are often planted in the open, where quite a large percentage will strike. Carnations are easily raised from seed and will flower in six months or even less. The variety known in the seed lists as Marguerite Carnations and spoken of as an annual variety is most useful, and grows very easily, its habit in Kenya being that of a perennial. The American tree or perpetual flowering Carnation is less successful than the border varieties.

Cerastium. A foliage plant, grey leaved, growing close to the ground, useful for rockeries and edges. Seed or division.

Cheiranthus (Wallflower). Unfortunately the beautiful and brilliant modern bedding varieties of this popular flower will not flower in Kenya, except in a few gardens at the higher altitudes; but it has been found that plants grown from seed of the single early Parisian strain will flower freely at all altitudes. *C. Allionii*, known as the Siberian Wallflower, a very showy orange-flowered, sweet-scented plant, has also proved successful in Kenya gardens. Seed or cuttings.

Chelone. Rather like *Pentstemon*, grows easily and spreads rapidly. Pink and scarlet. Height about 3 feet, easily propagated from root cuttings.

Chrysanthemum. This is a large genus, but the flower known to most amateur gardeners as a Chrysanthemum has many varieties, every one of which is grown in Kenya. The large Japanese varieties require special treatment, and should be grown in a nursery or in pots as in England; though very good blooms can be obtained without an immense amount of labour, provided heavy disbudding is adhered to, and the plant is well fed and the foliage kept free from fly and rust. Spraying with weak tobacco water may be needed; no plant will flower well unless kept clean and healthy. The ordinary border Chrysanthemum grows well practically everywhere, but its growth in the higher altitudes (7,000 ft. and over) is certainly much stronger and more upright than in and around Nairobi, where stakes must be used to tie the heads to. There is a very attractive variety of single Chrysanthemum of a great range of colours. To raise these flowers from seed repays the trouble involved, as such a varied collection is thus obtained; the usual mode of propagation is from rooted portions of the plant and is very simple, and blossom is very quickly obtained.

Cineraria. These decorative and free-flowering plants do excellently either as pot plants for the verandah or shade house, or planted out in the shady garden. Seeds of all varieties germinate easily. Colours are mostly in the blues, white or magenta shades, but the comparatively new variety 'Matador' is very striking, brilliant scarlet to coppery scarlet. *C. maritima* is a grey-foliaged plant much used in summer bedding in England. Seed.

Clianthus Dampieri. The Glory Pea of Australia. A very showy plant; the unusual combination of scarlet and black is very arresting. Has been grown with success in Kenya, but is liable to damp off. Raised from seed.

Coleus. These plants with coloured leaves are very easily grown from seed and are most ornamental; their colours are brighter when the plant is grown in slight shade. The flower stems should be picked off as soon as they appear; the flowers are quite insignificant. Grown for their ornamental foliage only.

Cuphea platycentra. The Cigar Plant. Charming little bushy plants with very small dark foliage and scarlet tubular flowers black and grey at the tip, which resembles the ash at the end of a cigar. Seed.

Cyclamen. See page 152.

Cypripedium. See Orchids below.

Dahlia. See page 138.

Delphinium (Larkspur). This is one of the finest garden flowers in cultivation, and has responded to the care and thought expended on it more than any other herbaceous plant. Fifty years ago the Delphinium was grown for its beautiful blue colour, but the flower stems were of no great merit; now it is a magnificent column of bloom of every shade of blue, mauve and purple. There are also cream-coloured varieties, the yellow *D. sulphureum*, and scarlet *D. nudicaule*. Every Horticultural Show has groups of these wonderful flowers, which are so striking that the public crowd round them. Equally fine specimens can be produced in Kenya, provided the same care is given to the plant as is given by the English growers; and we have the advantage of being able to grow our immense flower stem in less than half the time required in a temperate climate, and can also keep a succession of flowers going the whole year through.

Where plants are to be raised from seed it must be decided what variety is to be grown, so that the firm selling that particular strain should have the order in July; so necessary is it to get perfectly fresh seed that the packet should come by Air Mail. Unless some very special variety is required seed can be obtained locally, thus ensuring a good germination. Sow the seed thinly in a box or seed bed, very slightly covering with fine soil, and in ten or fourteen days the seedlings should appear; in six weeks they should be large enough to prick out into a well-made nursery bed. Here they should be left for another month, when the plants should be thinned out by transferring a portion of them to their permanent quarters, whether to the borders or to specially prepared beds. Those remaining should be 3 feet apart. Delphiniums must have plenty of room: it must always be remembered that to attain to the finest, a great deal of trouble is necessary; and the bed required to produce spikes of the ‘Blackmore and Langdon’ strains measuring 8 feet high must be properly trenched and manured, and constant additional stimulants and food must be given to the plant while it is growing. Also moisture from below is an essential ; a system of irrigation must be arranged for successful Delphinium culture. Bath water can be employed, and the plant flourishes, soap apparently having a beneficial effect ; but where many plants are grown it will be found more economical to make use of the stream, if such exists. There are many varieties of Delphinium now grown ; the 'Bella Donna' is most graceful and decorative, with a branching habit and flowers of a most beautiful saxe blue, though other colours have now been introduced. There are two indigenous varieties in East Africa worthy of a place in the garden, one of metallic blues and greens quite indescribable, which is found in many parts of the country. The other is white with a black centre, a branching habit, and a delicious scent, and grows in great numbers some 20 miles from Moshi on the road to Kenya. A very similar species is to be found on Mount Elgon. Propagated from root cuttings, division of roots, or seed.

Dianthus. See page 53.

Digitalis (Foxglove). It is no use trying to grow Foxgloves in Nairobi, for they refuse to flower, but at 8,000 feet they grow happily and flower profusely. Seed.

Erigeron. *E. speciosus*, the best known variety, has pale mauve flowers with golden centres and grows fairly well in most parts of the Colony. Seed. *E. mucronatus*, the Mexican Daisy ; this undefeated little plant seems as completely happy in Kenya as it is in an English rock garden or on a dry wall. It ramps impartially in sun or shade, but flowers more freely in exposed positions and on poorer soils, where it will make a mound of green closely covered with small daisies which open pink and turn white with age. Seed or division.

Eschscholtzia. Easily grown everywhere, flowers more freely in the higher altitudes. Seed.

Francoa ramosa (Bridal Wreath). Not much grown in

East Africa, but is easily cultivated and has given good results in some places. Seed.

Fuchsia. Grows well everywhere and is treated as a shrub. See page 103.

Furcraea Bedinghausii. An Agave-like plant with saw-edged leaves, and flowering in about six or seven years from seed; flower-spike is 15 to 30 feet high, much branched and covered with small hanging bells of pale sea-green, sweetly-scented. Half the flowers produce seed pods, and the other half form tight little green bulbils, which root as soon as they fall to the ground.

Gaillardia. The perennials of this genus are as easy and as excellent as the annuals, and can be had in various shades of yellow and red. Seed.

Gaura Lindheimeri. Long graceful sprays of white flowers. Has been grown with success in some parts of the Colony. Seed.

Geranium. See PELARGONIUM below.

Gerbera (Barberton Daisy). This beautiful flower has found a home to its taste in East Africa, where it is grown to perfection, and the hybrids attain to an immense size both in the circumference of the flower and the length of stalk. The colours range from white to a deep red, traversing every known shade of scarlet, pink, cream, salmon, yellow, and orange on the way. The culture is easy, but where generous treatment is applied both with water and forest soil the best results are obtained. Propagation from seed, which should be planted as soon as ripe, and by division of plants.

Gesnera. Easily grown from seed, succeeds very well, but is best grown on a verandah or in a shade house.

Geum. This is easily grown, but only flowers well in the higher altitudes. Seed.

Gloxinia. Can be grown successfully from seed, but should be kept in a shade house and requires special care; best grown in pots.

Gunnera manicata. An enormous plant which likes to grow near the water. It is used at the edges of ornamental lakes in England, and is practically untried in East Africa, though there is no reason against its successful cultivation. Seed.

Gypsophila paniculata *var.* **flore-pleno.** This is a perennial variety of great merit. Its double white balls are far more attractive than the tiny flowers of the ordinary single variety, but it is not so easy to grow and takes longer to flower. Seed.

Hedychium. A water-loving plant with handsome foliage, and very strongly sweet-smelling flowers. Very easy to grow. Propagated by division of roots.

Hedysarum coronarium (French Honeysuckle). This plant figures in many catalogues, and in Europe it may be as charming as it sounds ; but in Kenya it is a pestilential weed, with a vast and ineradicable root system and no flowers.

Heuchera sanguinea is the best variety to grow ; its graceful panicles of flowers make a great show and are excellent for cutting. Easy from seed.

Hollyhock (*Althaea*). Succeeds anywhere ; the double varieties are more difficult than the single to flower. These plants grow to a great height and make a very striking group. They must have a well-drained soil and do not demand a rich one. They can be propagated by root cuttings as well as easily grown from seed, local seed being the best.

Hunnemannia fumariifolia (Santa Barbara Poppy). One of the most charming of the Californian poppies ; greyish deeply cut foliage, and bright yellow flowers excellent for cutting. Given good soil is very easy. Seed.

Impatiens. See Balsam above, and page 169.

Lavandula vera (Common Lavender). Needs no description ; grows from cuttings or seed, but only flowers successfully at the higher altitudes. The *L. dentata* makes good hedges and is very sweet smelling, and even more aromatic than the Lavender found in English gardens.

Linaria. Some of the perennial Linarias do well in Kenya ; *L. dalmatica* flourishes at over 6,000 ft. and the new hybrid 'Canon Want' seems very happy at any altitude, making fine bushy plants covered with attractive spikes of pale pink flowers. Seed.

Lobelia cardinalis. This is a very handsome plant with scarlet flowers and dark green foliage ; has been grown with success from seed, but requires a good deal of water if it is to flower well. *L. Tupa*, a semi-shrubby species with tall spikes of red flowers, does well also.

Lupinus. The perennial varieties are successful only in the higher altitudes ; over 7,000 ft. they grow as they do in England. Seed. *L. arboreus*, bushy as its name implies, known colloquially as the 'Tree Lupin,' is most useful in a border and very good for cutting ; in the lower altitudes it grows but never flowers unless planted by the water. *L. polyphyllus* has grand flowers of yellow, pink, mauve, and purple in many shades.

Lychnis. Useful plants varying in height from 3 inches to 3 feet. Their flowers are of brilliant colours. Some have been grown with success at higher altitudes in Kenya. Seed.

Matricaria eximia. The 'Golden Ball' is the variety best known, though there is also a white variety. This plant has not been much grown in East Africa. It is propagated from seed.

Meconopsis. This is of the Poppy family, and probably the best-known variety is *M. betonicifolia* var. *Baileyi* (syn. *M. Baileyi*), the 'Thibetan Poppy' which is so popular in England. A flower of a lovely blue, and very easy to grow in temperate climates. There is, however, no record of success in Kenya, though many cases of failure are reported.

Mesembryanthemum. A very large genus of succulent plants with brilliant daisy-like flowers of every known colour except blue. There are many varieties that succeed admirably and are very ornamental ; they are most useful in the border, as many are quite low-growing and make a carpet of colour at midday, while others are erect growing and shrubby. They are sun-loving plants and grow from seed or cuttings.

Michaelmas Daisy. See ASTER above.

Mimulus. This is easily grown from seed and does well anywhere, provided it is near water ; it will grow magnificently in a water-furrow, like water-cress.

Mirabilis (Marvel of Peru). This is very easily grown from seed and makes a well-shaped bush about 2 feet high. Colours crimson, yellow and pink ; flowers at all times provided it is not allowed to get too dry. It is a dangerous plant in a garden as it spreads rapidly, and is difficult to eradicate owing to its very deep rooting habit. Seed or division.

Naegelia. Requires shade at 5,000 and 6,000 ft. and makes handsome pot and border plants, particularly *N. zebrina.* Now called *Isoloma hirsutum.*

Oenothera (Evening Primrose). Grows very freely in most parts of this country. The large variety is very handsome and a free flowerer ; there are many varieties, and some of the dwarfs are particularly good grown from seed which comes very quickly. Once established in a garden it will seed itself. The usual colour is pale yellow, as its unofficial name denotes, but there are also some good white varieties of which *O. taraxacifolia* has proved an easy plant in Kenya.

Orchids. The indigenous species, both terrestrial and epiphytic are described elsewhere (see page 169), and so far very few exotic species have been tried. *Cypripedium insigne* has done excellently as a pot plant in a shade house, and has even flowered, though rarely, planted out in the shade of a fig tree ; many others would probably do equally well.

A pink Vanda flowers freely in full sun in Mombasa, and an Epidendrum is very much at home anywhere. Unfortunately even the commonest epiphytic Orchids are very expensive to buy in England, and so far few gardeners have been rich enough to experiment with the species which grow in the cooler houses in Europe. One gardener high up on the Aberdares has imported a good many hybrid Cymbidiums, and these have lived and made a great deal of growth planted in wooden baskets with a compost of chopped fern roots, moss and decayed bamboo leaves ; but very few have flowered. Dendrobiums have also been tried in this garden and are living, and *Spathoglottis Fortunei* ; it seems probable that these plants may be happier at lower and warmer altitudes. Those requiring stove treatment would be of little use in Kenya where we have no damp heat.

Oxypetalum caeruleum. A truly lovely plant of the *Asclepiadaceae* with soft greyish-green foliage and the clearest china-blue star-like flowers. Will grow and flower at all altitudes, but is a finer plant over 6,000 ft. Seed, which is rather slow of germination at times.

Pansy. These delightful flowers can be grown anywhere if the grower is prepared to take enough trouble, for at the lower altitudes they are not quite easy, needing water and light shade from the very hot sun. About 7,000 ft. they grow as easily as they do in Europe and flower continually. Easily grown from seed, or increased by cuttings.

Pelargonium (Geranium). No description is necessary, but it deserves far more attention than is usually given to it in Kenya gardens, though there are now growers who are taking an interest in the Geranium. There is little doubt that in a few years many of the best varieties will be obtainable locally. The plant is so easy to grow, which is no doubt the reason for the neglect it has received ; cuttings rarely fail to strike and the demands of the plants are so simple—in fact many growers who do not study its tastes feed it too generously, with the result that the strength goes to the production of leaves and not flowers. It is wiser to plant the rooted cuttings in pots or in some other way restrict the root growth ; to hammer in rubble round the plant has a good effect. Some varieties grow into beautiful bushes of 4 feet high and can be kept symmetrical with very little trouble. To raise Geraniums from seed is well worth while, provided the best seed from a reliable firm is obtained. The germination is good, and one may get something that is really first class ; at the same time many of the seedlings will probably not be worth keeping. The seedlings should flower six to eight months after sowing.

Pentstemon. The garden varieties of Pentstemon are easily grown in all parts of the country, though in the higher altitudes, over 7,000 ft., the flowers are larger, the colours more intense, and the general growth of the plant more sturdy. But this should not deter those with gardens below this height from growing Pentstemons; they are a most useful addition to the border, and are easy to use when colour schemes are being arranged, because there are so many distinct shades that have been definitely fixed. Can be grown from seed, cuttings, or root division. The many Californian species have not yet been grown, but may be worth trying.

Phlox. The perennial variety has never been grown to any extent in East Africa owing to the wonderful results obtained with the various varieties of the annual *Phlox Drummondii*; but lately varieties of *P. decussata* have been grown with success and can be obtained in the country. Germination of the seed is somewhat erratic and slow.

Phyllocactus. One of the showiest and most satisfactory of the Cactus family, and deserving special mention. They are straggling plants with flattened leaf-like stems, some with a few prickles but mostly unarmed, and producing from the sides of their growths very large brilliantly coloured flowers, scarlet, crimson, pink, yellow or cream-coloured. They last well when cut and arranged in water. Cuttings and seed.

Platycodon. One of the few *Campanulaceae* to take to tropical life. Very little grown so far, but has flowered in Nairobi, and should undoubtedly do even better at higher altitudes. Seed.

Poppy (*Papaver*). There are several perennial varieties of this useful and ornamental flower, notably *P. nudicaule*, known as the 'Iceland Poppy' originally found in the Arctic regions, but fortunately it is a sun lover and is very happy on the Equator. It is easily raised from seed, but considerable care is necessary when planting out these tender subjects in the open ground. It is always wiser to have established the plants in a box in the seed house before their final move. Sow the seed, which is minute, mixed with sand and very thinly, and when the seedlings are big enough they should be pricked out into a box 2 or 3 inches apart so that each one can be moved later without disturbing the roots of the others. They grow and flower so well when established that the extra care necessary is paid for; and as a commercial asset they have a considerable value, the flowers being very decorative and living for a long time in water. *P. orientale* does not seem to give good results and there are very few grown.

Potentilla. *P. nepalensis* var. *Willmottiae* grows and gives a few flowers at the lower altitudes, and does quite nicely higher up. Other Potentillas should undoubtedly be tried. Seed.

Primula. This is a very large family, of which the Wild Primrose is a member; there is a sentiment about this flower, and most gardeners like to see it growing. Flourishes in many parts of East Africa provided that care is taken to protect the roots from the sun; at the lower altitudes the plant must be near water, but at 8,000 ft. the Primrose flourishes as it does in the woods of England. Raised from seed or division of plants. Other popular varieties of Primulas can be grown with care and trouble, *P. malacoides* being the easiest, while *P. obconica*, *P. sinensis* and *P. kewensis* are none of them difficult. For all plants of this class shade and moisture are the two essentials without which there is practically no hope of success. They all make lovely pot plants.

Pyrethrum. The garden varieties have not been a success in most parts of the Colony, though there seems to be no reason why they should not flower well. The commercial variety is now being grown extensively. Seed.

Rehmannia angulata. Of easy cultivation; the stems rise to a height of 4 or 5 feet and are loosely furnished with pink flowers resembling those of Incarvillea. Grown from seed.

Romneya Coulteri. A beautiful plant, with flowers like large white silken Poppies with a very full yellow centre. It is of a shrubby nature and succeeds in all parts of Kenya. Propagated easily from suckers.

Rudbeckia (Cone flower). Care is required to grow this flower, which under favourable conditions is an addition to the herbaceous border. Seed.

Salvia. No garden flower grows better than the Salvia in Kenya. There are at least forty different varieties cultivated in the Colony, and a few indigenous varieties also. The Scarlet Salvia is to be depended on to thrive anywhere and gives a magnificent show of colour ; and from it come the crimson shade and many others, practically all hybrids which have in most cases made themselves from the deep purple and scarlet. Among the best grown in Kenya are the following :

S. azurea var. *grandiflora* (*S. Pitcheri*), a grand deep-blue flowered, low-growing plant ; *S. albo-caerulea*, practically a shrub, flower blue and white ; *S. Bethelii*, a straggling grower with rosy magenta flowers ; *S. coccinea*, small brilliant scarlet with white and pink varieties ; *S. discolor*, black purple ; *S. leucantha*, purple and white velvety flowers ; *S. farinacea*, lavender-blue flowers ; and there is a white variety. *S. patens*, in both Oxford and Cambridge blue ; *S. Pittsii*, crimson scarlet and hairy. *S. van-Houttei*, deep reddish-pink flowers, is practically a shrub. All Salvias are best cut down after flowering, or before the next rains are due, and all grow easily from cuttings, layers or seed.

Scabious. Dealt with under annuals, page 58. Some perennial Scabious such as *S. caucasica* will grow in Kenya at the higher altitudes provided they are not killed by drought. Easily raised from cuttings as well as seed.

Sempervivum. If the half-hardy species from Madeira and the Canary Islands are grown, these succulent rosettes do excellently ; but the hardy Alpine species would scarcely be happy on the Equator. Seed.

Senecio. Flowers of considerable merit which have succeeded well in some gardens in Kenya. There are many species and varieties, differing in height from 2 to 6 feet, and in colour from clear rose to bright yellow. The plants are grown easily from seed.

Stapelia. Besides the indigenous species of these little succulents there are many which may be brought from S. Africa, and do very well in Kenya ; they are interesting and amusing in a collection of succulents and Cacti, and many have flowers more like marine creatures than flowers. Division.

Statice (Sea Lavender). The correct botanical name is *Limonium*. A most useful flower to grow, does well with a minimum of trouble ; there are very many pretty colours to be had and the form of the flower sprays is attractive. *L. incanum*, *L. latifolium* and *L. macrophyllum* are all perennials, but many of those listed in a catalogue as annuals become at least biennials in Kenya. Seed.

Streptocarpus. Handsome greenhouse perennial in England. It grows well in pots in the verandah or in a shade house. Can be raised from seed and should flower in about six months. There are two attractive indigenous species. See page 170.

Sweet William (*Dianthus barbatus*). This old-fashioned English flower grows and flowers very well in East Africa, particularly in the higher altitudes, but in a wet season lower altitudes have produced blooms of great size and perfection. Any small piece of the plant will grow, though if seed is sown, a number of varieties may be obtained.

Talinum patens. A cheery-looking plant with fresh green foliage, and thin sprays of tiny pink flowers only opening after 4 o'clock, followed by little red seeds. The plant is rather a danger, as it seeds freely and has deep carrot-like roots. Seed. There is an indigenous species with larger flowers.

Thalictrum dipterocarpum. This lovely little Meadow Rue does well with enough attention to see that it is well watered, unless grown by a stream, when it will be completely easy. Its tall loose sprays of clear mauve flowers are beautiful, and well worth a little trouble. Seed.

Trachelium caeruleum. Deep mauve or white. This is a good plant to grow as it gives generous return for the care expended on it in the early stages of growth. The seeds are minute and consequently have to receive rather special treatment. The flowers are a cloud of tiny flowerettes which live for an immense time in water. The plant is drought resisting, though it also flourishes in a damp situation. Easily grown from cuttings which strike readily; height in Kenya anything up to 5 feet.

Verbascum. Handsome large plants easily grown from seed, and useful for the back of the border as they grow to a great height; colours yellow and white. There is also a very charming species, *V. phoeniceum*, which is quite different, low growing. The flowers of these are far lighter and more graceful, and the colours principally mauves and purples. Height about 2 feet, and can be grown easily from seed.

Verbena. One of the most popular flowers in Kenya. They make magnificent sheets of colour, and grow with no difficulty from cuttings, and can be obtained in every colour but yellow. New varieties from Europe can be grown from seed.

Veronica. *V. longifolia* and *V. spicata* have flowered below 6,000 ft., but not very freely; at the higher altitudes these, and many other of the more shrubby species, might do very well.

Vinca (Periwinkle). *V. madagascariensis* has become almost a weed everywhere from the Coast upwards, forming bushy plants with very dark green foliage and white or (less desirable) magenta-pink flowers. No drought affects it, and the flowers last well in water. *V. major*, the Larger Periwinkle of English gardens, is also completely happy from 5,600 ft. upwards, and above 7,000 ft. is more prolific in bloom than I have ever seen it in other countries. Doubtless *V. minor* and its coloured varieties would be equally at home.

Viola. These charming 'tufted pansies' are grown in the same way as real Pansies, and also do best at the higher altitudes. Many amateurs are puzzled as to the difference between the two classes, *i.e.* Pansies and Violas. The former, which are entirely a garden race, were originally developed from *Viola tricolor*, the little wild Pansy of English fields; whereas the Viola, or tufted Pansy, is a later race formed by crossing the garden Pansy with *V. lutea* and *V. cornuta*, the charming alpine species so well known on English rock gardens; *V. cornuta* has given its descendants the more graceful flowers and lighter habit of growth which now distinguish them from the solider looking Pansy. Violas are true perennials. Seed and division.

Violet. This delicious flower is another of Kenya's favourites; in the higher altitudes the growth of the leaves, size of the flowers, and length of stalk, are a constant source of amazement even to the old inhabitants. Good soil and some manure increase the size of the flower, but the vegetative growth is inclined to become dense. Violets can be grown everywhere, though those of the higher altitudes are unquestionably the finest. Propagation by division of plants.

Wallflower. See CHEIRANTHUS above.

CHAPTER VIII

ROSES

Introduction — Altitude — Soil — Stocking a Rose-Garden — Planting — Watering and Irrigation — Manuring — Pruning — What Roses to Plant—Pests and Diseases—Propagation by Budding—Cuttings—The National Rose Society.

THERE is no more beautiful flower than the Rose, and we in East Africa can grow some very beautiful roses. Every garden should have its rose-trees—the smallest cottage garden at home is always full of roses, and the rose is so essentially English. And then think, how infinite are the varieties ; no other flower can boast of half as many, and every year yet still more varieties are bred and now there is every shade from the purest white, from the palest pink to the deepest red, and from the palest lemon to the deepest orange. Single roses, double roses, climbing roses, standard roses, bush roses—roses for every corner of the garden. And again, what flower has the exquisite perfume of a rose ? Violets, fresh-cut lavender, heliotrope, all are delightfully fragrant, but are they as delicious as a dark red rose-bud in the early morning when the dew is still on it ?

Rose-growing need not be an expensive hobby, nor need it be a difficult one provided that the conditions are normal. It is true that roses require more attention than a great many other flowers, but the little extra trouble is fully repaid and a rose-tree well cared for will be a joy for many years.

Altitude. Most roses seem to do well in Kenya at any altitude from the Coast up to 9,000 ft. ; and if any particular rose fails in a garden it is probably not the altitude that is to blame but some other or others of the circumstances of its culture. Thus in a Coast garden, for example, the soil is apt to be shallow, and to have had its fertility baked out of it by the sun, and to be overfull of lime from the underlying coral-rag, and to have a chronic lack of rainfall ; all these are conditions adverse to the growth of plants, but all can be remedied. Rambler roses seem to grow better above 6,000 ft. than below that height. Generally speaking, roses of the Tea and Hybrid Tea classes grow more easily in Kenya than in England, owing to the warmer conditions of soil and climate. One sees this with ' Mme. Abel Chatenay ' (H.T.) and ' Maman Cochet ' (T.), for example ; and among the climbers with ' Maréchal Niel ' and ' Niphetos,' which in England generally need a south wall or glass.

Soil. Roses will flourish in most if not all of the garden soils in East Africa. Regarded as plants, they seem to be easily satisfied and to ask comparatively little of the earth in which they grow. Thus they can be seen flourishing in a poor and shallow soil overlying rocky murrum in which most garden plants refuse to live ; and they grow perhaps best of all in a well-drained black cotton soil. Speaking generally, the heavier the soil the better will it suit roses.

Stocking a Rose-Garden. The easiest way to start a rose-garden is of course to buy trees locally. There are several very good professional gardeners in Kenya Colony with an excellent variety of roses for sale. Roses, however, that are otherwise unobtainable can be quite easily imported from Great Britain : the freight is not expensive, and they can travel as ordinary cargo and must be accompanied by a certificate stating that they are free from disease : all reputable growers at home know this and the buyer need have no worry. But whether the rose-trees be bought locally or from abroad, it is of the utmost importance that the date of dispatch should be left to the salesman, as he alone is in a position to know when best to move the trees. They must not be lifted unless they are in a dormant state, that is when the sap in the wood is not rising. If they are lifted when the sap is rising, it is almost certain that they will die on replanting.

Now, should trees be imported from Great Britain, they will be lifted during the winter months at home and will arrive in Kenya at the height of our summer—a most unfavourable time, but there need be no anxiety about this. Do not plant the trees in their permanent positions, but heel them in in any convenient place, shade them heavily and water them. A good tip to remember is to do this quickly. Have the trench ready, open the case in the evening, unfold the roots and cover them immediately with soil, as it is important that they should be exposed to the air for as short a time as possible. Later, when the rains are breaking, the trees can be lifted out again, and planted into their permanent beds, where they should be kept watered and under light shade until established. It should be remembered that the vast majority of imported roses are on the briar stock, and that this stock is found not to do well in Kenya, becoming spindly. The Blush Rambler stock used by our local nurserymen is better suited to our local conditions ; and most roses if propagated by cuttings do well on their own roots.

If trees are bought locally, it is very probable that they would be dispatched just before the rains break, and then no temporary heeling-in would be necessary.

Planting. Rose-trees thrive best when planted by themselves—a rose-bed should be a rose-bed and nothing else. They must see the sun and therefore should not be placed under or very close to a tree. They do not like the wind. A border of Violas or Lobelias does no harm to roses, but a good display of roses needs no embellishment ; roses are impatient of competition. The ideal rose-garden should consist of small beds, one variety in each bed, the colours carefully balanced. This does not mean that varieties should definitely not be mixed, but I believe that a far greater effect can be obtained by keeping them separate. The beds should be sufficiently small to allow the gardener to attend to the trees without having to step on the bed.

Now as to the actual planting. All bush-roses should be planted about 18 inches apart. A hole dug 2 feet square and 18 inches or more deep should be dug some considerable time before the rose is to be planted out. A nurseryman will tell you that round holes should never be used for planting, as the shape tends to pen the roots and prevent them from spreading freely in all directions. The two important points to be remembered in planting are these: firstly, the roots must be spread out horizontally and not planted vertically; and secondly, with grafted trees the surface of the soil must be level with the point of budding or a trifle below it, so that the appearance of suckers may be easily seen. In planting, spread the roots out horizontally, cover them with a little soil, shake the tree well to work the soil into the roots, and tread down firmly; add a little more soil and tread down firmly again, and so on until the hole is filled with the exception of the last two inches, which should consist of fine soil lightly raked over.

Many rose-growers advocate the use of manure (cow or goat manure) when planting, but this, although it may do good in very poor soil, is dangerous. The manure in Kenya has not the properties of the manure at home owing to the very strong sun, and there is great danger of severely burning the roots of the trees—in fact, even used as a top-dressing, it may prove to be dangerous. Young trees are, of course, more susceptible of being burnt than old trees.

As each tree is planted, it should be examined carefully for dead and damaged wood and wood dying back. Dead wood must be cut right out, and damaged wood and wood dying back must be pruned away. Look carefully to see that the snag of the stock is pruned off level with the bud. The trees then should be lightly shaded, and if there is no rain they must be watered so that the roots are kept moist. As soon as the trees are well established, the watering-can may be dispensed with if the rainy season is on.

Watering and Irrigation.—There are districts in Kenya where the rainfall is heavy and occurs throughout the year, and here roses may bloom on and off—or even almost continuously—without appearing to suffer for it, from one end of the year to the other. The same thing may be seen in drier districts if, as sometimes happens in wet years, the rain falls every month and no dry season occurs. A small rose-garden has been known to carry on in this way for fourteen months in succession, only the trees that were heavily pruned (a mistaken kindness) dying off. Such circumstances are, however, exceptional, and when the question of watering or irrigating a rose-garden in a dry part of the Colony arises, the importance of the following advice cannot be over-estimated. For a period in each year a rose-tree here must go dormant. During this dormant period the tree is resting, and it is also during this period that pruning must be done. At home the cold of winter causes the trees to become dormant, and they remain so until the warmth of spring causes the sap to rise once more. With the rising of the sap, the buds swell and finally develop into the shoots which will blossom during the summer and autumn.

In Kenya, except at altitudes above 7,000 ft. or more, there is no period throughout the year sufficiently cold to produce this dormancy, but it can be produced by withholding water from the trees. In other words, the dry periods in this Colony must be made to correspond to the winter months at home, and the rains to the summer and autumn months. If water is given during these dry months the sap will rise, the trees are given no rest, they will be in continual bloom throughout the year and their blooms will probably be vast in quantity but certainly poor in quality. Again, it is extremely difficult if not impossible to prune a tree with any degree of satisfaction if new shoots are continually being formed. There are, therefore, certain disadvantages about planting rose-trees close to water. The only occasion when water should be given to roses during a dry period is when there is real danger of losing the trees from drought ; and here a protective mulch of dry grass or litter is beneficial.

Manuring. The common practice of applying manure as it comes from the byre or stable to roses is definitely harmful : and much of its value has usually been burnt out of it by the sun or leached away by the rain. Well-rotted manure from a pit (see pages 29 and 36), on the other hand, is less open to objection, and has often been found beneficial. Inorganic manures such as basic slag, superphosphate, lime, bone-meal or broken-up bones, often do good; many rose-growers have reported well of a top-dressing of lime.

Pruning. Pruning is one of the most important operations that a rose-grower has to carry out during the year. The objects of pruning may be quoted from a standard gardening book as follows:

(1) The annual rejuvenation of the plant by inducing it to produce strong shoots from near the base to take the place of old or exhausted branches.
(2) The removal of all thin spindly shoots, thus keeping the tree open in the centre for the admission of light and air.
(3) Cutting away of all diseased or damaged shoots to a point below the injury, and the total excision of all dead wood.
(4) Restricting the rose plants to reasonable and convenient dimensions.
(5) The production of finer and fuller blooms.
(6) The prevention of 'legginess' which would result from allowing the plants to go unpruned.

The question of light or hard pruning depends on whether the roses are grown for exhibition purposes or for ordinary garden decoration. Roses grown for exhibition should be pruned harder than those grown for garden decoration.

No fixed rules can be laid down for the pruning of all varieties, but as a general principle it may be said that the stronger the growth the more sparingly should the knife be used, and the weaker the growth the more severely should it be pruned. The effect of hard pruning on vigorous trees would be to encourage the production of long flowerless shoots or coarse malformed blooms.

A rule which must never be broken is that all pruning must be done to an outside bud; if this is not done the shape of the tree will be spoilt and congestion brought about.

Rose-growers at home have an advantage over those in East Africa because books are published giving instructions for the correct pruning of every variety of rose; these instructions unfortunately do not necessarily hold good in Africa, and therefore one must rely on what local advice is available and on one's experience.

The pruning of climbing roses differs from that of bush roses. When the rose has finished flowering, cut out all old wood if a sufficient number of new shoots have developed. Strong new shoots that arise on the main stem at some distance from the base should be preserved and the old stems be cut back to those points.

The rose-grower should be equipped with the following implements for pruning: a sharp pruning knife, a pair of secateurs, a small pruning-saw and a pair of gloves. Much better and quicker pruning can be done when gloves are worn, and it is important that the knife and secateurs should be kept sharp. If either of these is blunt, the cuts will not be clean and the wood will very likely be bruised and damaged. The secateurs bruise more than the knife; all cuts should be as short as possible.

The correct time for pruning in East Africa is just before the rains are expected to break, which happens once a year in some districts and twice in others. The trees should then be dormant.

What Roses to Plant. The experience of rose-growers in the Colony seems to show that, broadly speaking, all kinds and all varieties of roses are likely to do equally well in any district. In other words, any rose that one wants to have is worth trying in any garden. Some guidance can naturally be obtained by seeing what varieties do best with one's neighbours; but the selection must not by any means be limited to these, and experience shows that a rose that flourishes in one garden may do quite badly in the garden next door. Roses of so many kinds and varieties are growing so successfully in Kenya that no list of their names will be attempted here. Readers are referred to the salesmen's catalogues and to the annual volume published by the National Rose Society, and are encouraged to back their fancy.

Pests and Diseases. By far the greatest danger to rose trees in outlying parts of East Africa is the havoc caused by the various kinds of buck, and it is essential that the garden should be sufficiently protected so that buck cannot get in. All one's work of careful pruning can be ruined by a bush-buck in one night. It is heart-rending to go round a rose-garden which has been eaten—all the tips of the new shoots eaten off, the shape of the tree very probably spoilt for life, and all chances of a good show of blooms for that season gone. Six foot wire-netting is the safest protection, with high gates : the netting is unsightly at first, but it can be quickly covered by climbing plants or concealed by a hedge. A hedge by itself is not enough ; a duiker will very soon find a place where he can worm his way through, and once a buck has tasted roses, no other food apparently attracts him so much and he will return every night until there is nothing left. No rose-tree can stand this treatment for long, and in a very short time it will be killed.

Other pests which do considerable damage are insects which appear at night—flying beetles, weevils and certain kinds of moth. These can be a great nuisance, as they damage the blooms and by coming at night are hard to deal with. Almost the only remedy is to go round the trees at night with an electric torch and pick them off by hand. By day these beetles can often be found buried just below the surface of the soil near the stems of the rose-trees, and destroyed. Blooms being grown for exhibition and in danger of attack should be protected by a fine muslin bag.

There are four important diseases prevalent in Kenya Colony : mildew, black-fly and green-fly, black-spot, and a small white scale that is perhaps the worst of the lot. Each of these can do a great deal of harm unless dealt with.

Mildew is easily recognisable : a whitish-grey fungus on the leaves, which soon curl up and become twisted and distorted. The best remedy for mildew is to spray with a solution of 1 oz. of liver of sulphur in 3 gallons of water. This should be done in the evening when the sun is not strong, and the finer the spray the better. No advantage is gained by drenching the trees as the solution will only drip off the leaves. This spraying should be repeated within a few days. A tip worth remembering is that if there is fear of mildew developing, trees should be sprayed just as the buds are bursting into leaf ; the solution then acts as a considerable preventative. Some varieties of roses suffer much more from mildew than others ; many varieties on the market now are absolutely immune to mildew.

Black- or Green-Fly, or Aphis, is also very easily recognised, forming dense colonies of green or brown insects clustered on the tender shoots. To destroy these, spray with a solution of 1 to 2 oz. of a disinfectant soap dissolved in 1 gallon of water. If the attack is not serious, the green-fly can be brushed off the shoots with a soft brush, or treated by dusting with tobacco powder on a damp day.

Black-Spot is so called because the disease takes the form of black spots which appear only in the leaves. Affected leaves should be removed and burnt, and the trees sprayed with a solution of 1 oz. of liver of sulphur in 3 gallons of water. The white scale is to be treated by spraying with a paraffin emulsion. See also p. 308.

Propagation by Budding. No horticultural pursuit is more fascinating than the propagation of roses by budding, and none is more simple. The method advised is that known as T- or shield-budding. Stocks should be grown on from cuttings of roses of strong habit and robust constitution, such as the Blush Rambler rose that is commonly used as a hedge throughout the Colony. The cuttings can be taken from this at any time, preferably during the rains ; they should be 10 or 12 inches long and as thick as a little finger. All except the top two buds should be trimmed off these cuttings, and they should be planted 6 to 8 inches deep in some shady spot and well watered. As soon as they are seen to be well established and growing freely, budding operations may begin. The earth is cleared away to a depth of 2 or 3 inches round the stock to be budded, because the nearer to its roots the bud is inserted the better, and a T-shaped incision is made here through bark and cambium down to the wood. A thin-bladed sharp knife is used : the horizontal cut of the T extends half-way round the stem, and the vertical cut is about an inch and a half long. Next lift up and detach the corners of the bark where the two incisions join, slipping the knife blade down between bark and wood with care to damage them as little as possible. Next choose a fully developed normal bud of medium size from a flowering shoot (or one that has already flowered) of the rose it is desired to propagate. With a sharp knife cut the bud away with a shield-shaped piece of the adjoining bark and underlying wood attached ; this shield should be an inch or less in length, narrow, and with the bud near its lower end. The woody part of this must be very gently detached from the bark and bud, either by fingers and thumbs, or by inserting a horse-hair between the two at the top and working it downwards until they are separated. The leaf from the base of which the bud grows will be found to provide a convenient handle for working the bud and its bark down into place in the T-shaped cut in the stock, so that the bark is covered over by the loosened edges of the vertical incision ; the top of the shield should be cut off square so that it fits exactly against the lower edge of the horizontal incision in the stock. Finally tie the inserted shield and stock firmly together by a cross-over winding of bast or any soft binding material, beginning at the lower end. In some three weeks such buds should be seen to be plumping up and growing, when the binding may be taken off. When the new growth is a couple of inches long the stock should be cut down to within half an inch or less of the bud ; it is important to tie both growing bud and stock to a stake to prevent all movement until the two are firmly united—two or three months—when a close pruning of the stock should be made.

The object of this budding is to provide roses that root unsatisfactorily with a stout and fibrous root-system ; and it is here recommended to amateurs because it is both simple and effective—in England it is widely used to produce the single exhibition blooms known as maiden roses.

Cuttings. In Kenya the majority of roses do well on their own roots, so that cuttings taken at pruning time and propagated on the usual lines (shade, water, and good soil) afford the gardener a cheap and easy supply of rose-trees.

Our final advice to every rose-grower is to join the National Rose Society if he or she has not already done so. This Society devotes its entire activities to encouraging, improving and extending the cultivation of the Rose by means of publications, the holding of Exhibitions and otherwise. The minimum annual subscription is 10*s.* 6*d.* ‘ The Rose Annual ’ which is published yearly by the Society is alone worth the subscription, and it issues many other useful publications about roses. The Society now has its own trial grounds at Haywards Heath which members are entitled to visit. Its offices are at 117 Victoria Street, London, S.W. 1.

CHAPTER IX

FLOWERING TREES AND SHRUBS

Introduction—Alphabetical List of Species.

PERHAPS no branch of gardening throughout the world has made such tremendous strides during the last half century as has the 'Shrubbery Garden.'

From being a dull dark place of gloomy evergreens, enlivened here and there with a Lilac, Laburnum or Rhododendron ponticum, it is now one of the best parts of any garden, and indeed invades the whole garden, as flowering shrubs are now largely planted in the backs of herbaceous borders and as specimen plants everywhere.

Here in East Africa they are indeed the backbone of our gardens, for they are easy to grow. Many of them are very quick, and once established (and they repay a year of care after planting), look after themselves, and do not disappear during the sometimes lengthy absences of the garden owner or during an extra long dry season, as do most of the smaller plants if neglected. A very large selection of shrubs and trees can be procured in this country from our local nurserymen, or from the Government Forest Departments. And any plant desired, but not in the nurserymen's catalogues, will always be procured by them if ordered. Serious gardening in Kenya is not much more than twenty years old, and so is still experimental, and in a few years' time many species of trees and shrubs not in this list will probably be doing well.

The lovely shrubs from Chile which flourish in Western Scottish gardens have not yet found a home in this Colony. Tried in Nairobi they failed, but some higher zone garden will some day acquire great merit by growing *Eucryphia* *cordifolia* and *E. pinnatifolia*, *Tricuspidaria lanceolata*, and *Desfontainea spinosa*. The Cistus family is also conspicuous by its rarity, yet many are of doubtful hardiness at home, and so sound likely to succeed in Kenya.

Unluckily few of the very hardy things from England succeed here ; Lilac has so far failed, and Rhododendrons do not like us.

In planting shrubs and trees, dig a large deep hole, 2 or 3 feet across and 2 or 3 feet deep. Put good boma or horse manure in the bottom (unless in a district badly troubled by white ants, when some good fertiliser is better), and fill with good soil. Plant your shrub with well-spread roots, firmly, and no deeper in the earth than the mark on its stem shows it was in before ; give it a can of water, unless it is raining, and make a shade over it, water again a week later if the weather is dry, and remember that a whole can once a week is better than a daily dribble. It is always best to plant early in your rainiest season, as rain-water does far more good than artificial watering ; there is so much more of it.

Give every shrub room to grow and expand. Many of them will grow into large bushes, and are far more beautiful if allowed space in which to do so. If a small specimen tree or shrub is to be planted out in a lawn, the grass and all its roots should be cleared away in a circle not less than 5 or 6 feet in diameter before planting ; and in subsequent years care must be taken to keep this area weeded and constantly free from grass above and below ground, clear of the ever encroaching grass-roots. As the tree or shrub enlarges the bare area round it must be increased in size, if it is desired to get the best possible growth and to minimise the chance that it will die off if a drought should occur.

Some shrubs require cutting back hard most years to prevent them getting straggly, but most are best left alone, being trimmed only, or kept in shape. Centre branches should be cut out to prevent crowding, and dead or very old wood removed, but do not forget that a shrub is a bush, and not a herbaceous plant, and should not, with possibly very rare exceptions be cut to the ground every year.

Most shrubs are readily increased by cuttings, and a sand box, as described on page 47, will enable even difficult ones to be struck with success. Seed is naturally a slower method. Some of the more difficult require layering, and a good many make layers naturally, forming roots on any branch left touching the ground. For details of all these methods of propagation see page 43.

The following trees and shrubs should do well at all altitudes unless otherwise stated, but it is well to remember that, speaking generally, the more tropical plants do less well at the higher altitudes. There are exceptions to all such rules, but when ordering shrubs a little thought as to their country of origin and your particular climate, may save much disappointment.

Abelia (Caprifoliaceae). Should grow well from Nairobi upwards. Evergreen shrubs. Increased by cuttings.

A. floribunda, rosy purple.

A. grandiflora, pale pink and white.

Abutilon (Malvaceae). Evergreen shrubs. Increased by layers and cuttings. Most varieties do well at all altitudes but *A. vitifolium* will not flower under 7,000 ft.

A. Darwinii, reddish orange.

A. megapotamicum (*A. vexillarium*), yellow in crimson calyx.

A. striatum, orange, striped red, with flowers like Chinese lanterns.

Acacia (Leguminosae). ‘Wattle,’ ‘Mimosa.’ Flowering trees. Can be kept low by pruning after flowering. Probably all varieties will grow in Kenya. Nearly all have yellow to creamy-white flowers. Many indigenous varieties. The best all-round garden tree is the ‘Golden Wattle,’ *A. podalyriifolia*.

A. Baileyana is suitable for the higher altitudes only, as it does not open its flowers lower down. Grown from seed.

Acalypha (Euphorbiaceae). Shrubs with coloured foliage.

Very useful at the lower altitudes. Grown from cuttings or layers.

A. hispida, lovely long racemes of flowers.

A. macrophylla, deep red, is one of the best.

A. marginata, brown and rosy crimson.

Acanthus. See page 162.

Acokanthera (Apocynaceae). Poison Arrow Tree. Indigenous small trees of two varieties. Seed.

A. longiflora is well worth growing as a shrub ; the red plum-like fruits are not poisonous, and are pleasant to eat.

Adenandra fragrans (Rutaceae). Small evergreen bush, heath-like foliage, white flowers. Very aromatic. Cuttings.

Adenium coetaneum (Apocynaceae). Indigenous succulent shrub. Showy rose-red flowers. Only suitable to lower altitudes ; see page 162.

Albizzia (Leguminosae). Quick-growing shade trees allied to *Acacia* ; not very good in gardens, as liable to pests and diseases, and surface rooting. Grown from seed.

Allamanda (Apocynaceae). Mostly scandent shrubs which can be grown as creepers, easy and beautiful. The majority are propagated by layers.

A. cathartica. Large yellow flowers.

A. Hendersonii. Even larger ; yellow.

A. neriifolia. True shrub, with small yellow flowers, very free flowering, and seeding profusely.

A. violacea. Very straggling ; flowers a curious wine pink.

Althaea (Malvaceae). *A. frutex* (more properly *Hibiscus syriacus*) is one of the Hibiscus genus hardy in England, and even then is often grown with the protection of a wall. In Kenya it does perhaps less well than the very many more tropical and beautiful species, which are grown in every garden ; but some of the modern varieties of *A. frutex* are undoubtedly beautiful, especially the white ones, and are worth a little trouble to get established. Cuttings.

Aloysia citriodora. See LIPPIA below.

Amygdalus (Rosaceae). Almond. These trees are being grown for a fruit crop in several districts, and will probably be good as garden trees in all but the lower areas. They should be grafted, and so are better procured from a reliable nurseryman.

Asclepias curassavica (**Asclepiadaceae**). Attractive small shrubs, orange scarlet flowers. Also many indigenous varieties, brown, yellow, etc., all quickly grown from seed.

Azalea indica (**Ericaceae**). Evergreen shrub or pot plant ; flowers well in the open border with light shade, at over 7,000 ft., and in Nairobi if planted near water. Requires good loam, with leaf soil or peat, if obtainable. Cuttings.

Bambusa (**Gramineae**). Bamboo. Many do well, but are best kept out of the smaller gardens. The wild bamboo of Kenya is *Arundinaria alpina*.

Barleria indica (**Acanthaceae**). Small evergreen shrub, with white or lilac flowers. Useful, but not showy. Seed.

Bauhinia (**Leguminosae**). 'Camel's Foot.' Small trees or shrubs, very handsome. The common name comes from the shape of the leaves, really a pair of leaflets, united for the greater part of their length and forming a single bifid leaf. Seed.

B. punctata (syn. *B. Galpinii*), scandent shrub, flame coloured flowers.

B. purpurea, tree, pinky mauve flowers, fragrant.

B. purpurea var. *alba* ; very lovely, with flowers like those of water-lilies.

B. taitensis, indigenous, small scandent shrub, flowers yellow.

Besides these, several unnamed species have been introduced with success.

Berberis (**Berberidaceae**). Grows fairly well, but is not encouraged in the Colony because the common *B. vulgaris* is considered a host plant for wheat rust ; the importation of plants is forbidden. There is, however, an indigenous variety, and all come easily from seed.

Bixa Orellana (**Bixaceae**). 'Anatto,' a small tree with pink flowers, and pods red and stiffly hairy. From the red pulp surrounding the seeds a colouring matter is procured, used in colouring butter. Seed.

Bouvardia (**Rubiaceae**). Small shrubs with lovely clusters of wax-like flowers. Rare at present, but easy to grow from seeds, layers, root cuttings, or ordinary cuttings.

B. angustifolia, scarlet.

'Crimson King,' garden hybrid, crimson.

B. Humboldtii var. *corymbiflora*. White, fragrant.

These are so far the only varieties known in Kenya, but there are many more which should be tried. So far grown only in the Nairobi district.

Brachychiton. See STERCULIA below.

Brayera anthelmintica. See HAGENIA below.

Brunfelsia (**Solanaceae**). Lovely shrubs with scented flowers; they should be in every garden. Cuttings.

B. americana, creamy yellow at first, changing to white.

B. eximia, slightly smaller then *B. Hopeana*.

B. Hopeana, 'Yesterday, to-day and to-morrow'; flowers violet to white and very sweet.

Buddleia (**Loganiaceae**). Useful quick-growing shrubs. So far the new species grown at home, such as *alternifolia* and *Colvillei*, have failed, and *globosa* will grow but not flower. Probably there are more which will do here, but at present the following are all that are proved good in Kenya. Layers and cuttings.

B. Lindleyana, mauve.

B. madagascariensis, orange. There is an indigenous plant very like this, growing at 6,000 ft.

B. variabilis var. *Veitchiana*, mauve.

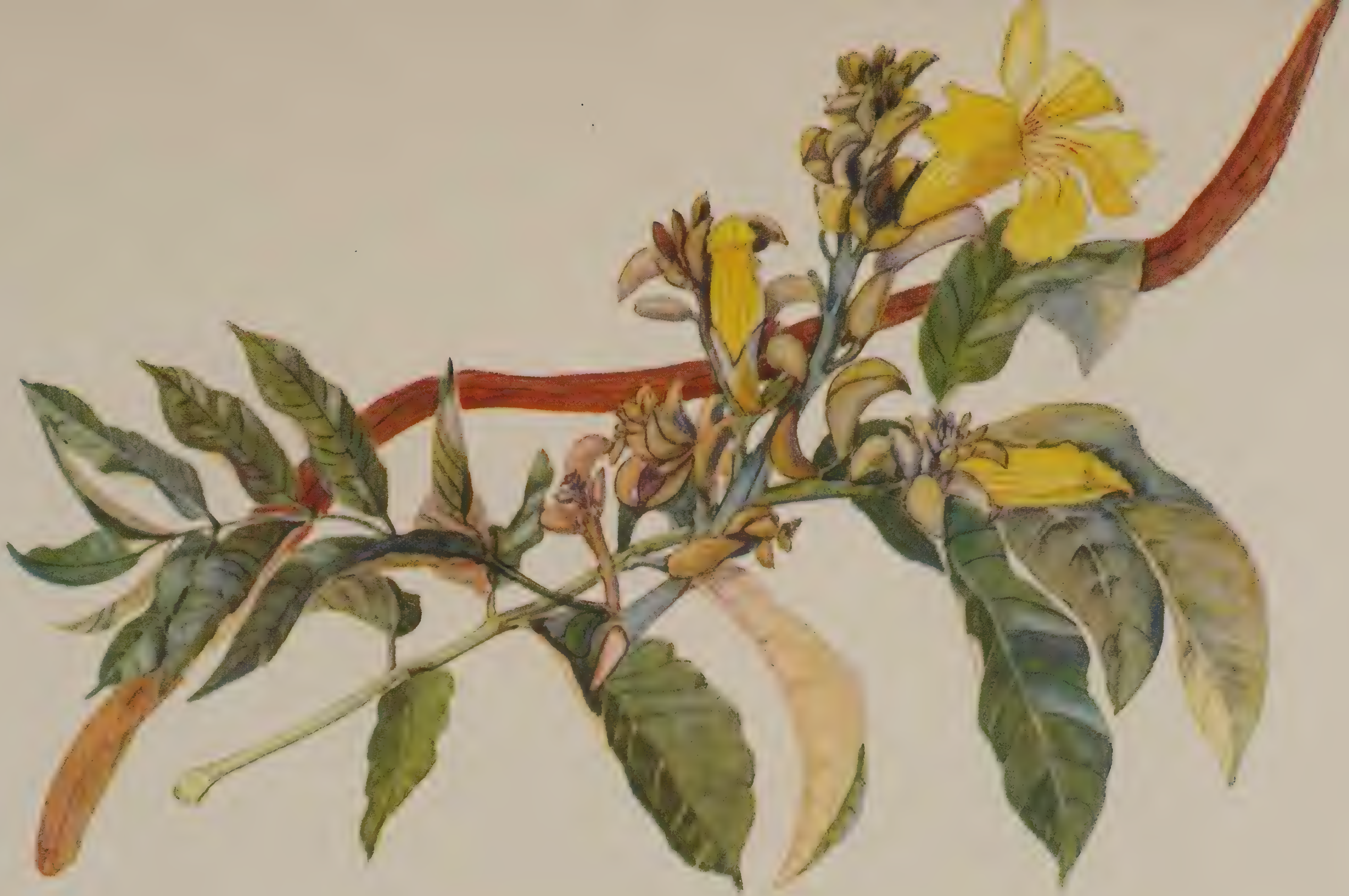
Burchellia capensis (**Rubiaceae**). Evergreen, flame-coloured flowers. This South African shrub takes little time to acclimatise, but is very good once it is happy. Cuttings.

Caesalpinia (**Leguminosae**). Brilliant flowered trees or shrubs near *Poinciana*, to which genus *C. Gilliesii* once belonged. Seed only.

C. Gilliesii. Straggling shrub, pale yellow, red stamens.

C. pulcherrima. Upright stiff shrub, flowers orange scarlet. Does best at lower altitudes but will flower higher.

C. sepiaria. An indigenous scandent shrub. It has pale



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MARKHAMIA HILDEBRANDTII
with seed-pod.

See page 159.

yellow flowers and is terribly prickly, and can be used as a hedge.

Callistemon (**Myrtaceae**). 'Bottle-Brush.' Small but very ornamental trees. Branches thickly set with red or white bottle-brush-like flowers. All grown from seed. The most familiar are :—

C. lanceolatus, drooping, crimson.

C. salignus, upright, creamy white.

Calodendron capense (**Rutaceae**). 'Cape Chestnut.' See page 157.

Calpurnia aurea (**Leguminosae**). 'Kenya Laburnum.' See page 158.

Camellia (**Ternstroemiaceae**). Doubtfully successful save at the highest altitudes. Cuttings strike readily.

C. japonica is proving the best so far, and flowers well.

Capsicum (**Solanaceae**). 'Chillies.' Many varieties; decidedly ornamental in fruit, and easily grown from seed.

Carissa (**Apocynaceae**). Thorny scandent shrubs, sweet-scented Jasmine-like flowers, berries edible. Seed.

C. edulis. See page 162.

C. grandiflora. 'Amatungula.' White flowers, single, fruit edible.

Cassia (**Leguminosae**). A large family, of which the commoner members thrive only too well, becoming weeds very easily. The more tender varieties do well at the coast, or in Uganda, including the beautiful pink *C. nodosa*. All grown from seed. Two indigenous Cassias are ornamental, viz. :—

C. didymobotrya, common everywhere, with upright spikes of yellow, brown-tipped flowers.

C. goratensis, less common and more beautiful; grows sparsely in the lower drier savannah country; large pale yellow flowers, sweetly scented.

Casuarina (**Casuarinaceae**). Not an ornamental flowering tree, and only included in this list with a warning *not* to plant it in the garden as nothing will grow near it, unless in a damp situation. It has one advantage, for it will grow in pure murrum.

Ceanothus (**Rhamnaceae**). Mauve and blue flowering shrubs. They do best at the higher altitudes, though *C. azureus* and ‘Gloire de Versailles’ flower happily below 6,000 ft. Seed and cuttings.

Cestrum (**Solanaceae**). Invaluable shrubs, flowers yellow, red, pink, cream and blue. Also there are many ‘garden varieties,’ as they hybridise freely. In the hotter districts they do best in shade. Cuttings. Among the best are :—

C. aurantiacum, orange, sweet-scented at night. Almost a tree.

C. coccineum, properly *Iochroma coccineum*. Red.

C. cyaneum, properly *Iochroma cyaneum*. Dark blue.

C. elegans, soft crimson.

‘Philippa Jane,’ cream.

‘Pride of Roselands,’ pink.

C. purpureum, mauve.

Chimonanthus fragrans (**Calycanthaceae**). ‘Winter Sweet.’ Unexpectedly this very hardy shrub is doing successfully in Kenya; has flowered in Kitale and is looking well in Nairobi, but is still rather new. Seed and cuttings.

Choisya ternata (**Rutaceae**). ‘Mexican Mock Orange.’ Does quite well below 6,000 ft. and should be good at higher altitudes. It is a lovely shrub with shining foliage and clusters of white flowers. Makes natural layers, also easy from cuttings of young growths.

Clerodendron (**Verbenaceae**). The shrubby varieties of this family do well, often too well.

C. capitatum, indigenous, is beautiful with its long-tubed white flowers; but it is dangerous in a garden as it suckers terribly freely.

C. fallax, with scarlet flowers, does not spread and is well worth growing.

C. fragrans will fill the garden if allowed, as will most of the big-leaved sorts, sending runners for many yards all around them. Suckers and cuttings.

C. myricoides, the indigenous ‘Blue Butterfly’ bush, is also worth growing.

Clianthus puniceus (Leguminosae) is proving a success in higher gardens and may do so lower down as well. Grown from seed.

Coleus thyrsoideus (Labiatae). Soft-wooded sub-shrub, covering itself with brilliant blue flowers. Very good. Seed.

Cordia Holstii (Boraginaceae). See page 158.

Coronilla (Leguminosae). Pretty little leguminous shrubs, best in light shade. Seeds germinate freely.

C. valentina, yellow.

C. varia, pale pink.

Cotoneaster (Rosaceae). Shrubs ; quick and easy.

C. pannosa is the commonly grown species, and it is very probable that many others would do equally well. Very easy from seed or cuttings.

Crataegus (Rosaceae). ‘Hawthorn.’ Chiefly grown for the ornamental berries. Seed or grafting.

C. pyracantha. See PYRACANTHA COCCINEA below.

Crotalaria (Leguminosae). See page 163.

Cydonia japonica (Rosaceae). ‘Japonica.’ This is one of the pleasant surprises of Kenya, for a plant flowering in winter in England ought not to do well here, yet it flourishes from 5,600 ft. up to the highest gardens. At lower altitudes it does not grow tall in the open, but it increases to a clump, and flowers almost every two months. The type does best, but the varieties are also worth growing.

Cytisus (Leguminosae). ‘Broom.’ These shrubs grow best at the higher altitudes where many do very well. A few will grow under 6,000 ft. but do not flower much, except *C. alba*, which occasionally does very well, and *C. canariensis*. *C. fragrans* is the ‘Genista’ of London florists. Grown from seed.

Dais cotinifolia (Thymeleaceae). A South African shrub with white flowers. Only just introduced to Kenya, but growing well. Seed and cuttings.

Daphne odora (Thymeleaceae). Probably the only Daphne yet grown in Kenya. Does well at 7,000 ft. Seed and layers. *D. indica* is a synonym.

Datura (**Solanaceae**). Flowering shrubs. All with large trumpet-shaped flowers.

D. chlorantha, pale yellow, double flowers. Seed.

D. fastuosa, purple ; annual or biennial. Seed.

D. sanguinea, orange-scarlet. Seed or cuttings.

D. suaveolens, 'Moon Flower, 'Angels' Tears.' White, very sweet-scented at night. The double form is *D. suaveolens* var. *Knightii*. Layers, seed, or cuttings.

Deutzia (**Saxifragaceae**). These pretty little shrubs flower quite freely in the higher altitudes, but are not worth growing under 6,000 ft. Cuttings.

Diervilla (**Caprifoliaceae**). The same may be said of these showy shrubs. A sparse flowering at the lower altitudes often corresponds to a heavy blooming at 7,000 to 8,000 ft. Suckers and cuttings. The following two varieties are worth trying at any rate: *rosea*, red; and 'Eva Rathke,' very deep crimson. Sometimes called *Weigelia*.

Dodonaea viscosa (**Sapindaceae**). A small indigenous tree or bush, up to 25 ft. in height. Useful as a quick-growing background or wind-break. Flowers inconspicuous, but the winged seed-pods turn a good red, and the foliage also, in dry sandy soils. Seed.

Dombeya (**Sterculiaceae**). Indigenous trees or shrubs worthy of garden space ; flowers white or pink, like apple blossom in effect. See page 158.

D. Mastersii, tree, above 7,000 ft. ; good timber and lovely when in flower ; not to be planted too near flower beds. Unlikely to do at lower altitudes.

D. nairobensis, shrub ; quite pretty, and good bait for night-feeding beetles !

D. umbraculifera, small deciduous tree in the Ukamba country and on the Coast ; very lovely, but not easy to get in the garden. Would probably not do above 6,000 ft.

Dracaena (**Liliaceae**). Three varieties occur wild in Kenya, and are all ornamental and 'tropical' looking in the garden. Others of this large family would doubtless succeed, and a few of the smaller sorts have done well. Seed and root cuttings. See page 160.

Duranta repens (**Verbenaceae**). Formerly known as *D. Plumieri.* Spreading prickly shrub, very quick growing, with lilac flowers and orange berries later; requires a good deal of pruning to keep in bounds. It makes a lovely clipped hedge, being evergreen and of a very bright colour. There is also a white variety. Very quick from seed.

Dyschoriste thunbergiiflora (**Acanthaceae**). See page 164.

Echium (**Boraginaceae**). A few of this family have been grown, and do best at the higher altitudes, though they will flower lower down, but less freely. Grown from seed.

E. fastuosum has compact heads of deep blue flowers, and does well.

E. strictum has a candelabra-like habit of growth, with grey foliage and paler flowers.

Eranthemum pulchellum (**Acanthaceae**). This shrub should possibly be called *Daedalacanthus nervosus.* But whichever immense name is chosen, the shrub itself remains a very beautiful one, covering itself twice yearly with almost gentian-blue flowers. Three to four feet high, it wants a forward position, and all dead heads are better cut off when the flowers are finished. Cuttings strike easily.

Erica arborea (**Ericaceae**). 'Tree Heath,' is indigenous all over East Africa at an altitude of 9,000 ft. and over, and will grow and flower in the lower altitudes also. The beautiful South African Heaths have so far done no good, probably needing peaty soil. Seed.

Eriobotrya japonica. 'Loquat.' See page 232.

Erythrina (**Leguminosae**). 'Kaffir Boom.' There is an indigenous tree, *E. tomentosa*, over a great part of Kenya, very beautiful when covered with scarlet lobster-claw flowers; and another larger tree in the Coast districts. Many other varieties have been imported and do well, and *E. Crista-galli* is well worth growing as a foreground shrub. Propagated by seed.

Eucalyptus (**Myrtaceae**). 'Gum Tree.' This vast Australian family does very well in Kenya, though most of them are too big for a garden and too greedy to grow anywhere near one; but some of the smaller ones are well deserving a place in it. All are grown easily from seed.

E. citriodora, with scented leaves, drooping branches, and white flowers.

E. ficifolia, the 'Red-flowering Gum' is lovely, and varies in colour from the deepest crimson to the palest pink or almost white.

Eugenia (**Myrtaceae**). Small trees or shrubs with evergreen shiny foliage. All white flowered and with edible fruits. *E. brasiliensis* and *E. Pitanga* (page 235) are both grown in Kenya, and probably others. Very pretty shrubs. Quite easy from seed.

Eupatorium (**Compositae**). White or mauve flowered shrubs. Some are too near native species to be valuable. Cuttings or layers.

E. ianthinum (syn. *Hebeclinium*). Purple flowers, large velvety leaves.

E. Weinmannianum has lovely shining evergreen foliage and seldom droops in the dry weather. Whitish flowers.

Euphorbia (**Euphorbiaceae**). Many curious looking indigenous trees are all over the country, commonly called 'Candelabra' trees; but they are not suitable for any but the largest gardens.

E. fulgens (*E. jacquiniiflora*) is the most beautiful small shrub, with arching boughs thickly studded with scarlet flowers. Cuttings; difficult.

E. pulcherrima, better known as *Poinsettia*, with many varieties having bracts that are creamy, yellow, rose, or scarlet, and there is a lovely double form of the latter. They are conspicuous shrubs in most Kenya gardens, save at the highest altitudes. This shrub can be cut back each season after flowering, if it is to be kept small; or equally successfully can be left to grow to a large bush 10 feet high or more, that flowers just as profusely as the cut-backs. Propagated by cuttings, or occasionally seeds.

E. splendens, 'Christ's Thorn,' a small, very prickly bush, with crimson flowers, is also most kindly in temper. It can be either clipped back to a low edging to beds (though it is inadvisable for small ones, as its roots are apt to usurp the whole bed), allowed to grow in a low spreading bush, or trained up sticks into standards. Any small piece stuck into the open ground will grow in wet weather.

Exochorda Giraldii (**Rosaceae**). This white-flowered shrub is grown here and there, and should be very successful in the higher gardens. Seed and cuttings.

Feijoa Sellowiana (**Myrtaceae**). A lovely shrub with grey foliage, white and red flowers with prominent crimson gold-tipped stamens, and edible fruits. It is doing well in many parts of Kenya. Cuttings.

Ficus Hochstetteri. ‘Fig Tree,’ the native ‘Mugumu,’ must be mentioned as an invaluable shade tree in all parts of the country, in which it is indigenous. Very large boughs can be planted as ‘cuttings’ and put where wanted to grow; they form trees in a year or so, and the mulch formed by their leaves, continually dug into the soil, makes a rich mould in which many things revel. See page 160.

Forsythia (**Oleaceae**) is being planted a lot, and may prove a success, especially at higher altitudes. Cuttings.

Fuchsia (**Onagraceae**). These showy little shrubs do magnificently all over Kenya, flowering more profusely perhaps in the cooler conditions. In low hot places they are better in shade.

F. alpestris from Brazil is much at home. A very scandent shrub.

F. corymbiflora, with its foot-long tassels of crimson tubes, seeds itself, and is indeed a beautiful plant, standing 8 or 9 feet high. The white variety is equally good.

F. gracilis, the hedge plant of southern English gardens, is a beautifully rampant plant here; and the number of the garden hybrids and varieties is countless. Easily grown from cuttings, preferably of new growths. Seeds are also worth growing, but do not always come true.

Gardenia (**Rubiaceae**). See also page 164. These well-known shrubs flourish when once established, and there are indigenous varieties which are quite worth growing. Layers and cuttings.

G. florida is the largest flowered of the cultivated varieties.

G. globosa, a shrub with beautiful white flowers.

G. intermedia flowers more profusely than the above.

G. urcelliformis, formerly called *Randia*, is an indigenous tree with scented white flowers spotted with brown ; handsome.

Genista monosperma (**Leguminosae**). A very lovely little tree, having weeping boughs covered with sweet almond-scented white flowers. Grown from seed.

G. canariensis, yellow, scented.

Grevillea robusta (**Proteaceae**). Too commonly grown as wind-breaks and shade trees in coffee to be appreciated as a garden tree, and also it is not a good friend to smaller plants near it ; while its constantly falling leaves make it a real nuisance, pretty as its orange flowers are. Seed.

G. Banksii, a red-flowered shrub, is invaluable and flowers continuously, but unfortunately is very hard to get started as seedlings will damp off. Seed.

Grewia (**Tiliaceae**). See page 164.

Gum Tree. See EUCALYPTUS above.

Hagenia anthelmintica (**Rosaceae**) is a magnificent indigenous tree of the higher altitudes, growing to 60 feet, with large hanging panicles 12 to 18 inches long of pinkish flowers ; unlikely to succeed much under 8,000 ft., sometimes known as *Brayera anthelmintica*.

Hakea eucalyptoides (**Proteaceae**). An Australian shrub ; grows quickly and easily, but very little tried as yet. Seed.

Hebeclinium. See EUPATORIUM above.

Heliotropium peruvianum (**Boraginaceae**). 'Cherry Pie' and all its innumerable garden hybrids grow into good shrubby bushes, not very long lived, but easily struck from cuttings, and in many soils they sow themselves freely. They should be well pruned each season before the rains.

Hibiscus (**Malvaceae**). This large family has a number of indigenous species, many of them worth cultivating, of which *H. cannabinus* (see Plate II, opposite page 48), with lovely deep violet flowers in its best form, is beautiful. The colour varies from the aforesaid deep violet through a scale of violets to an almost pale grey, and from that to pale yellow, all with deep magenta throats. The various yellow-flowered species are apt to be too rampant in a garden, but the small blood-coloured *H. aponeurus* (page 164) is good. Of imported species and varieties there are very many, and some grow to very large bushes. They do not do very well above 6,000 and 7,000 ft. Mostly grown from cuttings which root readily.

H. Denisonii, opening pink and turning white.

H. mutabilis, opening white and turning pink.

H. Rosa-sinensis, with a vast number of hybrid varieties of many shades of red, pink and white.

H. schizopetalus, with dangling tassel-like flowers of light crimson ; this is best at the Coast, only flowering sparsely at higher altitudes.

H. Scottii, bright orange. Makes good seed.

H. syriacus is the correct name of *Althaea frutex* above.

Holmskioldia sanguinea (Verbenaceae). A scandent shrub, with long spikes of browny scarlet, owing their colour (as in *Bougainvillea*) to the coloured bracts rather than to the small red flowers. A very rampant grower, and flowers better if cut back fairly hard every year or so. There is a pale apricot variety, less good than the type. Cuttings.

Hydrangea hortensis (Saxifragaceae). This popular plant seems to do best in tubs where the soil and water can be suited to its needs. It will grow in the open but remains low and small, and in the hotter parts seems to need either shade or a damp root-run.

Hypericum (Hypericaceae). ‘ St. John’s Wort.’ See page 164.

Iochroma. See CESTRUM above.

Ixora (Rubiaceae). These brilliant flowered shrubs are not yet generally grown in Kenya, but one or two have succeeded, and they may become popular plants in the lower altitudes. Cuttings.

I. alba and ‘ Prince of Orange ’ have both flowered in the Nairobi area.

Jacaranda mimosifolia (**Bignoniaceae**). No garden is complete without this beautiful tree, which, when covered with wonderful blue-purple flowers, is hard to beat; its foliage is also lovely. Best planted as an avenue, when the fallen flowers make a blue carpet on the ground. Or as an isolated group, if possible backed by larger trees as the flowers show less well against the sky. Not good near flower-beds or shrubberies as the falling leaves make an ugly litter of bare midribs all the year round. Grown from seed.

Jacobinia (**Acanthaceae**). These shrubs do well, given a little shade, and are of varying shades of pink except *J. Penrhosiensis* (or *Libonia*), a useful shrub having red flowers tipped with yellow. Cuttings or layers.

Jasminum (**Oleaceae**). Many sorts do splendidly, and there are several indigenous species. Among the imported ones are :—

J. gracillimum, a small shrub with white flowers.

J. nitidum, a shrub with large white flowers deep red in bud.

J. primulinum, a scandent shrub with yellow semi-double flowers.

J. revolutum (or perhaps *J. humile*), a shrub or small tree bearing bunches of yellow flowers.

J. Sambac, a very large scandent shrub, white waxy flowers.

Most of the above make runners that are easily dug up, and the others grow from cuttings.

Jatropha multifida (**Euphorbiaceae**). Ornamental shrub, with large much-divided leaves and heads of brilliant scarlet small flowers like branching coral. It likes a dry situation. Grown from seed.

Kerria japonica (**Rosaceae**). Seems to be growing quite well in the Colony, though likely to be better suited to the higher altitudes. Never very showy, but a friendly little shrub, with yellow flowers. The double variety is the best. Cuttings, layers and division.

Laburnum vulgare (**Leguminosae**). Is growing and flowering in gardens over 7,000 ft., but has so far not had time to prove whether it will do really well. Seed.

Lagerstroemia indica (**Lythraceae**). 'Pride of India,' 'Crêpe Flower.' Bushy shrubs with erect spikes of flowers, white, pink or magenta. Better kept cut down, after flowering, to a convenient height. Cuttings.

Lagunaria Patersonii (**Malvaceae**). A useful evergreen tree, dark foliage and pinky mauve flowers. Quick growing from seed.

Lantana (**Verbenaceae**). Showy, easy shrubs. Many of the species are dangerous weeds, but there are some, and many garden hybrids too, that are good and safe, and do not seed themselves as does *L. Camara*, the one common all over Mombasa Island. Runners, cuttings and seed.

Lasiandra. See TIBOUCHINA below.

Laurus nobilis (**Lauraceae**). 'Bay Tree'; does quite well anywhere in the Highlands. Cuttings.

Laurustinus. See VIBURNUM below.

Leptospermum (**Myrtaceae**). Many of these New Zealand and Australian shrubs do very well indeed. Easily grown from seed.

L. laevigatum, 'Australian Myrtle,' is the most commonly grown; white flowers. Seed.

L. scoparium is also grown a little, but the hybrid forms *L. Nichollii* and *L. Chapmanii* have so far failed.

Leucadendron (**Proteaceae**). 'Silver Trees' are being grown in the Arboretum in Nairobi, and look promising. Seed.

Leucaena glauca (**Leguminosae**). Small mimosa-like trees with white flowers in wee balls. Seed.

Libonia. See JACOBINIA above.

Ligustrum (**Oleaceae**). 'Privet' has proved quite happy; *L. ovalifolium* is the one most grown. Seed or cuttings.

Lippia citriodora (**Verbenaceae**). 'Sweet-scented Verbena.' This old favourite makes large shrubs, flowering freely, and can be cut back to the old wood twice yearly, after flowering. Grown from cuttings.

Lonicera (**Caprifoliaceae**). 'Honeysuckle.' Very few of the shrubby honeysuckles have so far succeeded here ; but one, *L. etrusca* var. *superba* (syn. *L. gigantea* var. *superba*), is definitely a shrubby species, with flowers very like those of the common honeysuckle in England, and the same scent. It is a lovely plant. Propagated by cuttings.

For other Loniceras see page 126.

Loropetalum chinense (**Hamamelidaceae**). This pretty-foliaged little shrub does very happily and is nearly always in bloom. Creamy, twisted little flowers. Cuttings.

Luculia gratissima (**Rubiaceae**). This most lovely of flowering shrubs is enormously well worth growing. Handsome in foliage, which turns red after flowering ; the flowers are in large loose bunches, white-flushed with palest pink, like beautiful fruit blossom, and very sweetly scented. Grown from cuttings.

Lycium horridum (**Solanaceae**). This evergreen thorny shrub is proving an admirable hedge plant, and, as its name suggests, will make a hedge that nothing will attempt to go through. Small mauve flowers and berries turning orange-red. Seed.

Mackaya bella (**Acanthaceae**). Pretty little evergreen shrubs with pale mauve bells, veined with darker colour. Very easy around Nairobi, and probably equally so at other altitudes. Natural layers, or cuttings. *Asystasia bella* is a synonym.

Magnolia (**Magnoliaceae**). These beautiful trees are not yet sufficiently tried in Kenya, and it is probable that, as a few have already done well, many more should also be successful. Seed.

M. fuscata. See MICHELIA FUSCATA below.

M. grandiflora flowers well in such widely divergent districts as Ulu, Nairobi, and Njoro, and so is well worth trying elsewhere ; for nothing is more beautiful than this evergreen tree with its dark foliage and huge creamy-white fragrant blooms. It is a bit slow at first, but is worth waiting for.

Melaleuca (**Myrtaceae**). Some of these Australian shrubs do very well, and they are pretty with their bottle-brush-like flowers. Only a few have been tried and there are many more which might be experimented with. Seed.

M. hypericifolia, tall, red flowers, scented leaves.

M. leucadendron, big shrub, white flowers.

M. longicoma, red flowers.

M. Preissiana, small foliage, white flowers.

Melia Azedarach (Meliaceae). 'Persian Lilac.' A very pretty small tree; much cut leaves and trusses of lilac-coloured scented flowers followed by yellow berries. It is not wise to plant it actually in a garden, except as a specimen tree away from other plants, as its suckers run for many yards, and are exceedingly difficult to get rid of. Seed or suckers.

Melianthus major (Sapindaceae). 'Honey Flower.' Handsome grey-leaved plant, with long spikes of brown madder flowers. Useful in making foliage colour-schemes, but a rather untidy plant. Seed.

Meyenia. See THUNBERGIA below.

Michelia (Magnoliaceae). Charming evergreen shrubs or small trees with sweetly scented flowers. Grown from cuttings.

M. Champaca. Small spreading tree, intensely sweet yellow flowers.

M. fuscata. Shrub with inconspicuous white and purple sweet flowers, but only scented after 4 o'clock in the afternoon.

Mimosa. See ACACIA above.

Montanoa bipinnatifida (Compositae). 'Daisy Tree.' Given good treatment and the right place, a very handsome little tree, with large ornamental foliage and covered with bunches of white daisy-like flowers. Quick growing but very short lived, a few years only; so seedlings, which usually abound around the trees, should be kept to replace the older plants. Seed.

Myrtus (Myrtaceae). 'Myrtle.' Needs no description. *M. communis* grows well and flowers profusely. Cuttings.

Nandi or **Uganda Flame Tree.** See SPATHODEA below.

Nandina domestica (Berberidaceae). Does excellently and is a pretty, dainty little shrub with its spiraea-like leaves and panicles of creamy-white flowers. Cuttings or suckers.

Nerium Oleander (**Apocynaceae**). 'Oleander.' This shrub is lovely, with all its many varieties, single and double, pinks, reds and white, from the Coast up to the higher altitudes. Cuttings of young shoots in sand, or older wood in a bottle of water.

Nicotiana glauca (**Solanaceae**). 'Tobacco Tree.' It is surprising to find a tree among the Tobacco family, but so it is. A very rapid-growing tree, better cut off at about 4 or 5 feet to make it bush out. Blue-grey leaves, rather like those of a young gum, and small tubular yellow flowers. Grown from seed.

Nierembergia frutescens (**Solanaceae**). An invaluable small sub-shrub for practically all districts. Light feathery foliage, and white or palest mauve flowers in continual bloom the whole year. Only 2 to 3 feet high. Grown from seed.

Nyctanthes Arbor-tristis (**Oleaceae**). A small tree or shrub, whose small white flowers open and smell sweet in the evening and drop in the morning. Not really worth growing except in a large garden. Cuttings.

Ochna. See page 165.

Olea (**Oleaceae**). There are various indigenous species of this family, and the sweet-scented *O. fragrans* (or *Osmanthus fragrans*) is growing well, but has yet to flower. This shrub is worth trying. Pleasant in foliage, it has masses of small creamy yellow flowers scented deliciously. Easily struck from cuttings of young growths.

Oleander. See NERIUM above.

Oncoba Routledgei. See page 165.

Palms. See pages 165, 186.

Pentas. See page 165.

Pepper Tree. See SCHINUS MOLLE below.

Philadelphus (**Saxifragaceae**). 'Syringa.' Several specimens of these popular shrubs are succeeding fairly well out here, best at the higher altitudes. So far it is an unscented species which is more often grown. Cuttings.

Phlogacanthus thyrsiflorus (**Acanthaceae**). A little-known evergreen shrub, capable of withstanding drought, and handsome when covered with upright spikes of brick-flame coloured flowers. Cuttings strike easily.

Phlomis (**Labiatae**). These little shrubs from Southern Europe should be more experimented with. In hotter districts they need shade and good leaf soil, but doubtless would be less particular in cooler and damper places. Grown from seed.

Phyllanthus nivosus *var.* **roseo-pictus** (**Euphorbiaceae**). A prettily coloured little shrub ; leaves variegated with green, red, pink and white, and useful in the garden when flowers are scarce. Flowers inconspicuous, under the leaves. Cuttings.

Pittosporum (**Pittosporaceae**). Many of these little trees or shrubs do well and are charming in foliage, and numbers of them have intensely sweet-scented flowers, besides aromatic leaves. Seed.

P. crassifolium makes a good tree, but so far has not flowered.

P. Tobira, a small shrub, is starting well.

P. undulatum, the 'Incense Tree,' is the best known in this Colony ; dark green leaves, and creamy sweet-scented flowers followed by orange-yellow berries.

Several others are being tried with success.

Plumbago capensis (**Plumbaginaceae**). This well-known blue-flowering shrub is happy in most places, and is one of the plants which has to be kept in bounds, both cut back and dug round, as it suckers terribly and spreads rapidly if allowed to do so. *P. rosea* is very lovely, but more difficult to grow.

Plumieria acutifolia (**Apocynaceae**). 'Frangipani.' This is one of the first shrubs to delight one on arriving in Mombasa, and it grows well up to about 6,000 ft. Above that it is less certain. It is one of the easiest to propagate ; any big branch put in and kept watered should strike, and most of the year it bears fragrant white flowers in big trusses. *P. rubra*, with red flowers is less easy, but a good shrub; and there are other hybrids of colours varying from red to white.

Podalyria (Leguminosae). South African trees or shrubs. *P. calyptrata* grows well and quickly from seed, bears many pinky mauve pea flowers, and is continuously in bloom.

Poinciana (Leguminosae). Of these, the most beautiful tree is *P. regia*, the 'Flame Tree,' which flowers only at the Coast. Grown from seed.

P. Gilliesii. See CAESALPINIA above.

Poinsettia. See EUPHORBIA above.

Pomegranate. See PUNICA below.

Protea (Proteaceae). 'Sugar Bush.' Seeing that there is an indigenous species of this interesting family, *P. abyssinica*, with white flowers, it is reasonable to suppose that many of the beautiful South African species should do well here, but actually they have failed in many places. However, bushes grown from imported seed are now doing well and flowering at Njoro, where possibly the lighter soil may suit them better than a heavy red coffee soil at many lower altitudes. They are well worth experimenting with. Seed.

Prunus (Rosaceae). The garden varieties, such as *P. Pissardi*, do well in the higher altitudes, and *P. Amygdalus*, the Almond Tree, is being grown as a crop at 7,000 ft.; and anywhere over 6,000 ft. would probably be worth planting as a garden ornamental tree. Below that the *Prunus* family do not flower much, except the Peach, *P. Persica*, which grows happily everywhere.

Psidium (Myrtaceae). 'Guava.' While *P. Guajava* (page 231) is purely a fruit tree, and outside this chapter altogether, *P. Cattleianum* is a charming shrub, with shiny evergreen leaves, pretty white flowers, and small deep crimson fruits that are very refreshing to the garden worker. It grows quickly from seed.

Punica Granatum (Lythraceae). 'Pomegranate.' This is a tree worth having. Its shiny leaves and scarlet flowers are very decorative, either on the plant or cut for the house; and the big red fruits, splitting to show the crimson seeds, are the most unreal looking objects and always excite interest in visitors fresh to tropical gardening. It may be clipped into a hedge if wanted and grows probably anywhere in the country. Seed or cuttings.

Pyracantha coccinea (Rosaceae). Fiery Thorn. White flowers and red berries.

Pyrus japonica. See Cydonia above.

Randia. See Gardenia above.

Raphiolepis indica (Rosaceae). An evergreen shrub with white flowers. Pretty, but not very showy.

R. japonica has larger flowers and is a smaller bush. Both propagated by cuttings.

Reinwardtia trigyna (Linaceae). Once known as the 'Tree Flax.' Charming shrubs with large buttercup-like yellow flowers, doing best in the shade in hot dry places. Suckers.

Rhododendron (Ericaceae). So far a disappointment, though several people have tried importing them. *R. ponticum* is the only one which has had a small measure of success. It is conceivable that the tender varieties from Java and such places might be more successful in East Africa.

Rivina humilis (Phytolaccaceae). A mildly pretty small shrub, with very small pinky-white flowers in pendent racemes, followed by scarlet berries reminiscent of red currants. Rather a weed. Seed.

Robinia hispida (Leguminosae). This pink-flowered tree grows anywhere, but flowers in some places only, and seldom very freely. Seed and suckers.

Rondeletia (Rubiaceae). Lovely shrubs, not yet widely enough grown. Cuttings strike easily ; also grown from seed.

R. amoena. A tall shrub, covered with small waxy pink scented flowers. It dislikes getting very dry, but is well worth a bucket of water once or twice during a long drought.

R. odorata. A very small bush, red flowers.

R. odorata var. *major.* A small bush with scarlet flowers that are not scented despite its name.

Rosmarinus officinalis (**Labiatae**). ‘Rosemary.’ Grows well in any good soil. Cuttings or layers.

Rumex abyssinicus (**Polygonaceae**). ‘Sorrel.’ This is an exceedingly showy, indigenous, scandent shrub, like an immense Sheep Sorrel; and this note is merely put in as a warning *not* to introduce it into any small garden, for it becomes rampant beyond words, though undoubtedly beautiful.

Russelia juncea (**Scrophulariaceae**). ‘Antigua Heath.’ Pretty willowy shrubs, thickly set with scarlet tubular flowers; easy and lovely. Suckers and cuttings.

Ruttya speciosa. See page 166.

Schinus molle (**Anacardiaceae**). ‘Pepper Tree.’ Very ornamental tree, with weeping branches, small flowers in racemes, and red purple berries. Best grown as specimen trees, both because they then get room to grow properly. and because they are very bad neighbours for other plants. Seed.

Sesbania (**Leguminosae**). Small trees of rapid growth, with laburnum-like, mostly yellow, flowers. Sometimes grown as quick shade for young coffee, but of doubtful value, owing to the long shallow roots which take too much from the surrounding soil.

S. grandiflora with pink flowers, might be worth growing. Seed.

Sida Schimperiana (**Malvaceae**). A small evergreen indigenous shrub, with tiny yellow flowers; makes a good substitute for a box edging as it clips well, but is not advisable for very small beds as its roots run a long way. Seed.

Solandra grandiflora (**Solanaceae**). A large scandent shrub, perhaps better grown as a climber, with large butter yellow, upright bell flowers many inches in length. It is growing well in this Colony, but being a new introduction has not yet flowered. Cuttings.

Spartium junceum (**Leguminosae**). ‘Spanish Broom.’ This shrub grows magnificently anywhere from 6,000 ft. upwards; below that it flowers but sparsely. It is a really good garden plant, being nearly always in bloom and excellent for house decoration. Seed.

Spathodea nilotica. See page 159.

Spiraea (Rosaceae). Many of the shrubby Spiraeas do excellently, and many more might be tried with advantage. The herbaceous plumy species do not seem happy below 6,000 ft., though the higher places might be able to grow them. The commonly grown varieties are :—

S. cantoniensis or *Reevesiana*, white.

S. cantoniensis var. *flore-pleno*, its double form, white.

S. japonica and its variety 'Antony Waterer,' pink. Cuttings, suckers, layers, seed or division.

Sterculia acerifolia (Sterculiaceae). A very lovely flowering tree, requiring some patience as it may not flower for ten years after planting. But it is very beautiful when it does do so, usually when leafless, and becomes a crimson mass of bloom. Seed.

Streptosolen Jamesoni (Solanaceae). A wonderful shrub, with masses of brilliant orange flowers, and almost constantly in some flower. It grows at any altitude and loves full sun. It should be trimmed, but not hard pruned, and is propagated easily by cuttings of soft new shoots, *not* hard wood. Occasionally it refuses to grow, disliking some places rather unaccountably ; but more usually it is splendidly easy as it loves sun and drought.

Strobilanthes (Acanthaceae). Beautiful Indian shrubs not yet well enough known in East Africa. Cuttings and natural layers.

S. asperrimus is a very rapid-growing evergreen shrub ; small mauve flowers in erect spikes.

S. Dyerianus has leaves marked with purple, and pale lilac flowers.

Sutherlandia frutescens (Leguminosae). Pretty little short-lived shrubs from South Africa ; pale grey-green foliage and flame-coloured flowers ; quickly raised from seed.

Swainsonia coronillifolia (Leguminosae). Small shrubs with spikes of purplish crimson or white flowers. Seed.

Tabernaemontana coronaria (Apocynaceae). Rather overrated small shrub, with dark evergreen leaves and white flowers like small Gardenias. It is probably better in Coast gardens, liking heat. Cuttings.

Tamarix (Tamaricaceae). 'Tamarisk.' A pretty feathery-leaved shrub insufficiently tried so far, but the right species might be a big success. *T. gallica* has lived for many years near Nairobi, and if we could get *T. rubella* from Algeria it might do very well.

Tecoma (Bignoniaceae). Very useful shrubs and small trees.

T. capensis, scandent shrub with orange-scarlet spikes of flowers and good dark green pinnate leaves. It suckers freely, and layers wherever it touches the ground, requiring ruthless discipline to keep it in its place. It can be grown for its timber.

T. Smithii is one of the best of the true shrubs, having orange-yellow trumpet flowers with bronze markings outside, in loose trusses. It does best well pruned.

T. stans, the commonest. Yellow trusses, rather straggling growth. All grow quickly from seed or suckers.

Templetonia retusa (Leguminosae). Small-leaved evergreen shrubs with scarlet flowers. Slow growing, upright and tidy, and a specimen in full flower looks as though the whole bush had been dipped into red ink. Seed.

Thevetia neriifolia (Apocynaceae). A very pleasant shrub, growing almost to tree size in the warmer districts, but probably no use above 6,000 ft. Its yellow bell-like flowers are deliciously scented, and its narrow leaves are of a nice fresh green. Seed.

Thunbergia. See page 166.

T. erecta (syn. *Meyenia erecta*). A South African species very much like *T. affinis*, with slight leaf differences and paler lilac-blue flowers, is worth growing. Seed.

Tibouchina (syn. *Lasiandra semidecandra*) **(Melastomaceae).** Perhaps one of the most beautiful shrubs grown in Kenya, with its violet flowers, and pink velvet calyx and buds. It is a very rapid grower, and flowers freely, but is sadly brittle, and a high wind, or a heavy shower when it is in flower, may snap the branches off and leave a wreck. It is therefore best cut back every second year at least; and possibly putting a wire round the young growths about a foot or two above the old wood might help to keep it from breaking. Grown from cuttings.

Tinnea aethiopica. See page 166.

Turraea. See page 166.

Ulex europaeus (Leguminosae). 'Gorse,' 'Furze.' This homely, if prickly bush grows really well at 8,000 to 9,000 ft., but below that is hardly worth planting, though it will live and produce occasional flowers. It is really grown anywhere from sentiment rather than reasons of beauty, and it is impossible in Kenya to reproduce English hillsides golden with gorse. Seed.

Veronica (Scrophulariaceae). The shrubby Veronicas have not been at all widely tried in Kenya, but a few are grown, and with success, especially over 6,000 ft., when they flower very freely. Seed or cuttings.

Viburnum Tinus (Caprifoliaceae). 'Laurustinus.' Grows and flourishes at 9,000 ft., and will probably do so much lower, but it has not yet been very widely tried. *V. Carlesii* failed near Nairobi, but might do higher. Seeds, layers, and cuttings.

Vitex Agnus-castus (Verbenaceae). 'Chaste Tree.' Very lovely deciduous shrub, with branched spikes of lavender-blue flowers; insufficiently known so far, but evidently easy and well worth growing. Cuttings.

Weigelia. See DIERVILLA above.

Wigandia urens (Hydrophyllaceae). This magnificent looking plant is too big for small gardens, but when there is space to spare a group of it is very ornamental, with its immense leaves armed with pricking hairs, and huge trusses of lilac-blue flowers. It is better cut down every year or so, as it becomes leggy and straggly if left alone, but shoots rapidly from the base if cut back. Grows with vast rapidity from seed.

Xylotheca (Bixaceae). Allied to the indigenous *Oncoba*, page 165. Dark foliaged evergreen tall shrub or small tree, white gardenia-like flowers; very well worth growing. Seed.

CHAPTER X

CLIMBING PLANTS

Introduction—Alphabetical List of Plants.

There is a great choice of beautiful climbers that flourish in East Africa, and few plants are more satisfactory to grow, or more beautiful when in flower.

It is sometimes difficult to find suitable places for climbing plants, and it is doubtfully wise to cover the house with them for several reasons. The rain water from a clean roof is often the best drinking water, many of the climbers are so strong and heavy that they soon destroy the roof, and heavy foliage all over a house attracts spiders, mosquitoes and possibly snakes, though the latter do not bother us much in Kenya. It is better to confine the climbing plants on a house to the smaller, lighter growing sort, and keep them below the roof and water gutters. Garages or workships may well be covered, but not stables, lest insects be encouraged. Pergolas should be either built of stone or cement, or if of wood then only of ant-resisting timber, such as the local Red Cedar or Muhugu, and even then, if it can be done, a footing in cement or concrete is a great help to longevity. It is important that all bark should be stripped from the timber to be used in a pergola.

Perhaps better than a pergola, which gets densely covered and very heavy and on which the plants may only flower at the top, is a series of separate arches, on which each plant can be seen to full advantage, and can more easily be kept tidy and in control.

The very rampant climbers can be accommodated on the outside of the wire-netting round a tennis-court, if wire and supports are very strong, or to make a good background, or as screens to hide back premises or unsightly places; and in some cases are beautiful if allowed to cover some old tree, but if planted too close to the bole of the tree they have a hard time at first to get enough food to make good growth.

Wire fences dividing the garden from the road, farm, or other gardens are quickly made beautiful by creepers; and occasionally an isolated tripod of timber makes a good stand for a showy specimen.

Adenocalymna nitidum (Bignoniaceae). Nice easy climber with bright yellow bignonia-like flowers. Cuttings.

Allamanda. See page 94.

Ampelopsis (Ampelidaceae). These popular creepers do surprisingly well in Kenya. Perhaps not ramping as they do in Europe, but growing well enough, and even making good colour.

A. hederacea is perhaps the quickest growing out here. Cuttings or layers.

Antigonon leptopus (Polygonaceae). 'Coral Creeper.' This lovely pink-flowered plant is at its best at the Coast, or at Entebbe, Jinja and Kisumu; but it will grow and flower, though far less profusely, at higher altitudes, and is always worth trying. Plant in full sun; it appreciates rich food, but needs a well-drained soil. Seed or cuttings.

Araujia sericofera (Asclepiadaceae). Strongly twining plant, forming ropes of its own growths; pretty pinkish flowers deliciously scented; quick growing. Previously known as *Physianthus albens*. Seed.

Aristolochia (Aristolochiaceae). 'Dutchman's Pipe.' A large family of climbing plants of which probably most species will succeed in Kenya. All are grown from seed. The following are at present grown with success at between 5,000 and 6,000 ft.

A. elegans is the best known, with lovely purple, brown and cream mottled, saucer-shaped flowers, and reversed parachute-like seed pods. A rampant plant.

A. fimbriata, a smaller plant in all ways, with tiny attractive brown and yellow flowers.

A. grandiflora, larger flowers, with a twisted tail to them, darker coloured and evil smelling.

A. ridicula, very old green-brown flowers, more curious than beautiful. Also ill-smelling at certain stages, and a very rampant creeper.

Beaumontia grandiflora (**Apocynaceae**). A beautiful and very strong creeping plant, with oblong dark green leathery leaves, and trusses of large white trumpet flowers each about 6 or 7 inches long. Very handsome, but very heavy. It is beautiful climbing up a tree, and perhaps best so, and if put over an arch it must be a very strong one. It is too heavy to put over a house. It can be cut back and kept to a semi-shrub-like plant, but its long curling growths, rather like small pinkish green snakes, are constantly growing out and twining in all directions. Occasionally large cucumber-like seed pods are produced, but the seeds do not germinate, and it is best increased by layers.

Bignonia (**Bignoniaceae**). A very large ornamental family, very many of which are grown in Kenya, and the naming of which presents difficulties owing to the quantity of garden hybrids existing between the many species. They are also apt to be mixed up with the Tecomas (which see below) owing to the likeness of the flowers. All grown from layers or cuttings.

B. Chamberlaynii (now known as *Anemopaegma racemosum*) is a graceful delicate-looking plant, with pale creamy-yellow flowers.

B. Cherere (syn. *B. Buccinatorum*), one of the most beautiful. Large bunches of cherry-scarlet flowers with yellow throats ; a strong grower.

B. chrysoleuca, very rampant, rooting wherever it touches the ground ; large heads of butter-yellow and white flowers. *B. albo-lutea* is very similar to it.

B. magnifica, strong growing, more shrubby, with harder wood. Purplish crimson flowers.

B. purpurea, very lovely masses of lilac-purple flowers. Most insidious long thin creeping growths.

B. Tweediana, yellow, having small foliage and fascinating little claw-like hooks with which it catches on to walls or trees.

B. venusta. 'Golden Shower.' The best known of all, and when covered with a mass of brilliant orange waxy trumpets very hard to beat. An accommodating plant, as it will either ramp up the tallest trees, or cover large houses, or, if preferred, can be cut hard back and recover very quickly.

Bomarea (Amaryllidaceae). One of the few climbing families that is bulbous rooted, forming bunches of small tubers at the end of fleshy roots. Long twining stems with leaves the whole length, and the flowers borne in a many-stalked bunch from the very tips of the growths.

B. Lehmannii has taken very kindly to Kenya soil, and has deep orange flowers, speckled with brown.

B. multiflora has also flowered—a golden orange—and there are many more species yet to try. Seed, or division of existing plants.

Bougainvillea (Nyctaginaceae). Very well known and popular climbers, and from the Coast up to 6,000 or 7,000 ft. they are a feature of nearly every garden ; but they do best under 6,000 ft.

B. glabra is the darker purple sort.

B. spectabilis (syn. *B. brasiliensis*) is the rosy red variety.

B. spectabilis var. *lateritia* is brick red.

B. splendens is the common magenta one, ever flowering.

The variety 'Mrs. Butt,' a wonderful purple crimson, is the newest and perhaps the most magnificent.

Other colours appear from time to time among seedlings, a pale pink being a very pretty one. They are all propagated from cuttings, preferably of second-year wood, which, if planted near a stream or furrow, and so kept damp and also shaded, will strike easily.

Canarina (Campanulaceae). Herbaceous plants, climbing by means of their leaf-stalks ; leaves roughly ivy-shaped and toothed. Flowers are hanging bells of various shades of orange ; see Plate V, opposite page 192.

C. campanulata has small bells, deep reddish orange. Seed.

There are two indigenous species, both far more beautiful than the above, with bells over 3 inches long, orange flushed with red. One grows from the ground with a thick fleshy root-stock, and the other, more graceful, seems epiphytic on trees or rocks in the damper forests.

Ceropegia (**Asclepiadaceae**). From the fact that several species occur indigenously in the Colony, it is probable that others of this curious family of twiners might succeed. For those who like unusual plants these are worth growing. Seed or cuttings.

Clematis (**Ranunculaceae**). The brilliant large-flowered hybrids of the *Jackmanii* type so well known in England are a little difficult here, but by no means impossible ; and at higher altitudes can be very good. Lower, in the red coffee soil, they are apt to refuse to climb, but planted on a sunny bank they will sprawl along and give quite a lot of flower.

C. Armandii is a very permanent climber, with striking long narrow leaves and masses of white bloom.

There are several indigenous species, all near to *C. vitalba*, the wild ‘ Traveller’s Joy ’ of England ; a particularly fine form grows on the lower slopes of Mount Elgon. Many others should be experimented with ; forms of *C. montana* or *C. indivisa* var. *lobata* might prove successful.

Clerodendron (**Verbenaceae**). The climbing species of this genus are very charming, and do not sucker like the shrubby ones. Cuttings.

C. Balfourii. See *C. Thomsonae*.

C. splendens, very showy, brilliant scarlet flowers, deep green leaves.

C. Thomsonae, pretty crimson flowers in creamy-white calyx.

Clitoria Ternatea (**Leguminosae**). ‘ The Butterfly Pea.’ Graceful plants with blue (or white) flowers borne singly along the climbing stems. Seed.

Cobaea scandens (**Polemoniaceae**). A quick-growing creeper, with Canterbury bell-like flowers, coming out green and turning to a deep violet. It is really best covering some unwanted small tree, as its very fine tendrils like small twigs to catch hold of. Grown from seed.

Combretum abbreviatum (**Combretaceae**). A splendid indigenous climber, going to the top of tall trees and draping them with its large cymes of brightest scarlet flowers ; with very hard and constant pruning it can be made to flower as a large shrub, but the secateurs need to be used almost weekly. Layers.

Convolvulus (**Convolvulaceae**). The annual *C. major* and *C. minor* are easy and apt to seed themselves too much ; see also *Ipomoea* below.

Cryptostegia (**Asclepiadaceae**). Sprawling climbers, and at their best in hotter districts where they flower more freely. Grown from seed.

C. grandiflora has purple flowers, and is often mistaken for an *Allamanda.*

C. madagascariensis, mauvy pink, more like *Ipomoea.*

Dipladenia amabilis (**Apocynaceae**). So far one of the few representatives of a beautiful family of twiners. Not a very strong grower ; has trusses of clear rose-pink flowers, rather like those of a pink *Mandevilla.* It makes a beautiful picture trained over an arch. Unlikely to succeed in the higher colder districts. It is hoped that other varieties will be introduced in time. They all require a very sheltered position, out of the wind, and in full sun.

Eccremocarpus scaber (**Bignoniaceae**). A charming little climber with orange-scarlet flowers. Very little grown in Kenya, and not too fond of drought, but worth trying. Easily raised from seed.

Ficus repens (**Urticaceae**). 'Fig.' A small evergreen creeper useful to clothe a wall or trellis with green, closely matted foliage. To do well it requires a shady and damp position.

Gloriosa (**Liliaceae**). This is rightly in the bulb section (page 147) ; but as they all climb by their leaf tendrils they are undoubtedly also climbing plants. There are several indigenous species, all well worth inclusion in any garden.

G. virescens, illustrated in the Frontispiece, is the more common native red species, and a very tall yellow-flowered one comes from forests in the Nandi country and up Mount Elgon. There are others of both colours in different parts of the Colony.

Hardenbergia (**Leguminosae**). Small pea-flowered creepers, allied to, and very much mixed up with, **Kennedya**. Attractive, but not very showy. Grown from seed.

H. Comptoniana, purple or lilac flowers in small clusters.

H. monophylla, red flowers, less easy than the above. They appear to like half shade, or to grow in company.

Hedera (**Araliaceae**). 'Ivy.' People seem to like to grow this to remind them of home. Perhaps luckily it only grows moderately well, but it can be a dangerous pest when it ramps freely, destroying buildings and killing trees. Where so many beautiful flowering creepers can be grown it is better left out.

Hoya carnosa (**Asclepiadaceae**). 'Wax Flower.' A very lovely thing for a sheltered shady spot; long twining growths with leathery leaves and pendent branches of pale pink flowers which are darker and entirely wax-like in bud, more like Dresden china when open. Slow growing. Cuttings and layers.

Ipomoea (**Convolvulaceae**). A very large family, with many species indigenous in the Colony that are mostly too large and rampant in growth for the ordinary garden. It may be remembered with advantage that in Elizabethan days in England the more common name for the family was 'Devil's Guts,' and many of them, once introduced, are never got rid of again. The well-known beautiful annual 'Morning Glory,' *I. rubrocaerulea*, heavenly blue, is always a joy. Seed.

I. Bona-nox, white, scented, night flowering, is beautiful.

I. coccinea, annual, small, with prettily cut leaves and scarlet-crimson flowers.

I. Horsfalliae, an evergreen, with shiny cut foliage and cherry-red flowers in terminal bunches, is well worth growing.

I. Horsfalliae var. *Briggsii*, much like the last, but more floriferous. Flowers in pairs all along the twining growths, and shining waxen buds.

I. Learii is a beautiful blue also, and for furnishing a trellis away from other plants is good, but it is among the 'Devil's Guts' section otherwise.

I. setosa, annual; bristly stems and lilac flowers.

I. versicolor (*Mina lobata*, page 57). Pretty annual, ornamental foliage, with yellow and scarlet tubular flowers. Doubtless many others as good could be grown.

Ivy. See HEDERA above.

Jasminum (Oleaceae). There are several indigenous climbing Jasmines, with typical white scented flowers, some of them pink in the bud; but they mostly want a deal of room.

J. officinale, commonly grown in England, does not flower readily at the lower altitudes, but will do so at 7,000 ft. and over. Many of the species quoted in the shrub list (page 106) can be trained as climbers, as they are mostly scandent and adapt themselves readily to training. There are also good indigenous species which are rampant climbers and very sweetly scented.

Kennedya (Leguminosae). Small pea-flowered creepers, much confused with Hardenbergia above. It is doubtful whether any true Kennedyas are grown in Kenya, though there is no reason why they should not succeed. Seed.

Landolphia (Apocynaceae). A family of highly ornamental plants. There is an indigenous species, with large white flowers which make one hope it may find a place in gardens.

Lapageria rosea (Liliaceae). A handsome evergreen climber with large rosy waxen bells; is well worth trying. It does magnificently at higher altitudes, and the variety *alba* should also do well.

Lathyrus (Leguminosae). 'Sweet Peas' grow anywhere from 5,000 ft. upwards, but do far better over 6,000 ft. and are difficult below that. The 'Everlasting Pea' of English gardens will not flower, unless the high altitudes can do it; but the pretty *L. pubescens*, with soft periwinkle-blue flowers does well below 6,000 ft. and can be very lovely. Grown from seed.

Loasa (**Loasaceae**). Curious climbing plants, with attractive flowers, but unfortunately with poisonous stinging leaves, which make them not really worth growing. They are quite easy otherwise from seed.

Lonicera (**Caprifoliaceae**). 'Honeysuckle.' Many of these are grown and do well. Layers or cuttings. Some of the best are :—

L. Hildebrandtiana, giant-flowered, opening white and turning golden yellow, very scented. A magnificent plant for a bold position.

L. japonica, creamy-white to orange, and very sweet.

L. sempervirens, scarlet, not scented.

Lophospermum scandens (**Scrophulariaceae**). A handsome but untidy plant. Leaves heart-shaped and slightly toothed, flowers like large Foxglove bells and rich pink. Climbs by its leaf-stalks, dies away completely after flowering to grow again in the next rains ; this plant may be more rightly called *Maurandia scandens*. Grown rapidly from seed.

Mandevilla suaveolens (**Apocynaceae**). A quick and lovely white-flowered scented climber ; should be kept away from other plants as it has a very strangling hold. Seed.

Maurandia Barclayana (**Scrophulariaceae**). A pretty little creeper, making a wonderful curtain of small bright green leaves thickly sprinkled with violet-coloured flowers ; very quick. There are also different coloured varieties, pink, lilac, etc., but they are less good. All from seed.

Mina lobata. See IPOMOEA VERSICOLOR above.

Momordica chinensis (**Cucurbitaceae**). A handsome plant having dark green glossy leaves, and fairly large cream flowers with a dark centre. Seed.

Mucuna pruriens (**Leguminosae**). 'Cow-itch.' This plant also is included chiefly as a warning ; its dull purple, inadequate pea flowers are not ornamental, and its dangerous stinging pods, clothed in rufous velvety hairs are so attractive that people want to stroke them, and then wish they had not done so ! Seed.

Muehlenbeckia (Polygonaceae). Attractive, wiry, matted creepers, flowers inconspicuous. Seed.

Nasturtium. See TROPAEOLUM below.

Passiflora (Passifloraceae). 'Passion-Flower.' A very large family of beautiful flowered plants, many of them with edible fruits, of which several are already grown in Kenya. Mostly from seed.

P. caerulea. No one should plant this species. Its flowers are dingy, its fruits inedible, and it does so well that it usurps the whole garden by sending threadlike roots to great distances, where they thicken up and form fresh plants. A really dangerous species.

P. edulis. See page 230.

P. ligularis. Properly this also should be in the fruit section ; but the beauty of its large heart-shaped leaves, sweet-scented lilac flowers and ornamental (and delicious) apricot-orange fruits, make it well worth inclusion in the flower garden, as a screen behind beds, or on the wire round a tennis court.

P. racemosa (syn. *P. princeps*), a slight-growing, few-leaved species, with pendent trusses of deep rose-pink flowers, very lovely.

P. violacea, very beautiful mauve flowers with a blue corona of filaments.

Petrea volubilis (Verbenaceae). One of the most beautiful of all climbers, with large trusses of violet-coloured flowers. It has curious brittle papery leaves, and the flowers are like little velvet violets put into lighter violet paper calyces. It does not seem very particular, growing in a variety of soils and districts, but not yet proven at the higher altitudes. Cuttings.

Physianthus albens. See ARAUJIA above.

Podrana. See TECOMA BRYCEI below.

Quisqualis indica (Combretaceae). A rampant climber when happy, flowers opening white, turning pink later and finally deep crimson, sweetly scented at night. Very good from the Coast up to 6,000 ft., not much tried above that. Cuttings.

Rhodochiton volubilis (**Scrophulariaceae**). Very attractive, delicate-looking climber, preferring light shade; tubular flowers of a dark prune colour, almost black, with white anthers, set in a lilac-mauve cup-like calyx. Seed.

Rhynchospermum. See TRACHELOSPERMUM below.

Roses, Climbing. See Chapter VIII.

Smilax (**Liliaceae**). There is a handsome rather large-leaved species indigenous in the Colony, and the little Smilax-like plant commonly used in table decoration in England, properly called *Asparagus medeoloides* (*Myrsiphyllum asparagoides*), also grows very easily. Division of bulbs.

Solanum (**Solanaceae**). Easy and showy plants.

S. jasminoides, white; particularly good if planted among rambling roses to which it seems to do no harm; grown from seed.

S. Seaforthianum, small deep violet flowers later producing red berries, deeply-cut leaves, very pretty; grown from seed.

S. Wendlandii, one of the showiest of our creepers. Terribly prickly, large foliage and big trusses of lilac-blue flowers. A very strong and rampant grower, needing lots of room, and requiring full sun. Suckers, root cuttings.

Sollya heterophylla (**Pittosporaceae**). Despite its brightness of light green foliage and easy growth, this creeper is not worth the room it takes, as its charming little sky-blue bell flowers are so few and far between that they never make a show. Possibly the other species, *S. parviflora* (*S. Drummondii*) would be of better value. Grown from seed.

Stephanotis floribunda (**Asclepiadaceae**). This well-known climber does beautifully planted against the wall of a house, but is at times very slow to flower. Cuttings of the previous year's growth, or seed.

Stictocardia campanulata (**Convolvulaceae**). A most beautiful crimson-scarlet Ipomoea-like climber, so far only grown at the Coast, and it should be tried at a higher altitude, but it is not easy to propagate. Cuttings.

Stigmaphyllon ciliatum (Malpighiaceae). ‘Golden Vine.’ A very pretty climber with lovely ivy-leaved foliage, the young growths of which are tinged with red, and bright yellow flowers. Cuttings of ripened wood.

Tacsonia (Passifloraceae). Very near *Passiflora*, and have equally brilliant flowers. Grown from seed. Some of those so far introduced are :—

T. manicata, one of the showiest ; glowing scarlet flowers.

T. mollissima, long-tubed soft pink flowers.

T. Van-Volxemii, long-stalked, pendent, cherry-red flowers.

Tecoma (Bignoniaceae). Much confused with Bignonias, but distinguished easily by the more fern-like arrangement of their leaves, and by a terminal leaflet instead of the tendrils which are at the end of all young Bignonia leaves. All increased easily from cuttings or layers. The following are the most grown :—

T. australis, lovely small shining dark-green foliage, which is invaluable for cutting for the house, and lasts very long in water. Upright trusses of very small creamy flowers with a maroon throat.

T. Brycei, ‘Zimbabwe Creeper.’ Terribly strong grower and wonderful to cover a screen or trellis quickly. Masses of large rosy flowers, sweet-scented. It must be given lots of room in full sun, as shade prevents flowering in all the Tecomas. Now called *Podrana Brycei*.

T. capensis. See page 116.

T. grandiflora, a less rampant grower, and forms little foot-like roots by which to cling to a post or house-wall. Very lovely big trusses of orange-red flowers, but unfortunately less free-flowering than *Brycei*.

T. jasminoides, a strong twiner once established. Good shining dark foliage and white flowers with purple throats. A very good creeper.

Thunbergia (Acanthaceae). There are many climbers or creepers indigenous to this part of Africa, many of them very well worth allowing a place in the garden. All grown from seed.

T. alata is the orange dark-throated one that grows all over the Colony ; it is too free and easy to be encouraged in the garden, though very pretty.

T. coccinea is not worth growing ; it has small dingy red flowers and suckers badly.

T. Gibsonii, of a plain glowing orange, with hairy leaves and stems is far more beautiful than *T. alata* and less pushing, and should certainly be grown. An evergreen larger species from Tanganyika is more doubtful, as it roots readily wherever it runs, and climbs and clings too tightly.

T. grandiflora, an imported species, large lilac-blue flowers.

T. grandiflora var. *alba*, a white variety.

T. primulina is a very lovely native, primrose yellow, violet-throated, found around Thika and Makuyu districts. A species newly found near Lake Victoria grows freely and has large pale lilac flowers.

Tourretia volubilis (**Bignoniaceae**). Charming little annual creeper ; bright green fern-like foliage and small scarlet flowers, followed by interesting seed-pods covered with reflexed prickles. Seed.

Trachelospermum jasminoides (**Apocynaceae**). A delightful plant in every way. Evergreen, dark foliage, and myriads of small white star-flowers, intensely sweet ; succeeds in all parts of the Colony, in sun or shade. One of the most desirable climbers. Cuttings.

Tropaeolum (**Geraniaceae**). 'Nasturtium.' All the well-known annual species and varieties do magnificently, and are by no means to be despised, even if they are very common. They are now to be had in many wonderful colours, and the recent double-flowered variety, *T. Bodgeri* var. *flore-pleno*, 'Golden Gleam,' has proved a success.

The tuberous species have so far failed, but have not yet been extensively enough tried.

Vanilla (**Orchidaceae**). There is an indigenous species which climbs all through and over clumps of trees on the outskirts of forests. A curious plant, not unlike a string of green sausages, with a thick leaf between each. It produces, rather rarely, Orchid flowers, pale yellow with a purple lip.

Virginia Creeper. See Ampelopsis above.

Vitis. 'Grape.' See page 218.

Wax Flower. See Hoya above.

Wistaria (Leguminosae). These old friends take a long time to establish themselves in Kenya, and do not flower for many years, or grow properly ; but once they start they both grow and flower freely and are always lovely. At the higher altitudes they 'get away' sooner, and do really better. Best propagated from layers.

W. chinensis and its varieties do best.

W. multijuga has not yet flowered.

CHAPTER XI

BULBOUS ROOTED PLANTS

Introduction—Amaryllidaceae—Araceae—Begoniaceae—Bromeliaceae—Compositae — Geraniaceae — Gesneraceae — Gramineae — Haemodoraceae — Iridaceae — Liliaceae — Liliums — Nymphaeaceae — Orchidaceae — Pontederiaceae — Primulaceae — Ranunculaceae — Scitaminaceae.

Conditions in East Africa are suited to the growing of a wide range of bulbous-rooted plants, by which is meant all plants having bulbs, corms, rhizomes, tubers and fleshy roots, the majority of which for convenience will be referred to as ‘ bulbs.’ This chapter deals chiefly with such as may easily be grown in Kenya, particularly those which can be grown between the altitudes of 5,000 to 6,000 ft. Those of us who live under cooler conditions will realise that their choice is even wider, especially when it is recollected that very many of the usual garden bulbs are of African origin.

In selecting permanent positions for bulbs (the term is used in its widest sense to comprise all the bulbous plants referred to, and does not mean merely the English spring-flowering bulbs) the following points should be borne in mind.

1. Conditions which are suitable in other countries or even other districts must often be modified, and in hot, dry places this can largely be accomplished by providing shade and additional moisture.

2. Bulbs need not be lifted and stored for fear of frost, and most kinds are better left undisturbed ; but all require protection from vermin ; mice, moles and porcupines are particularly destructive, whether the plants be dormant or growing.

3. No bulbs can contend successfully with Couch Grass, and although some bulbs thrive best in full sun and away from tree roots, others must have shade, humus and moisture, even if they have to share the supply of moisture with the roots of trees and shrubs. Certain trees are greedier than others and life under them is difficult.

4. In dry porous soil, particularly when the conditions are hot, the proportion of bulbs requiring shade is considerably greater. It is not easy to generalise, as conditions vary enormously, not only in different districts but in different gardens in close proximity, and one's own experience and that of others soon enables one to know what is required in the way of moisture, shade and cultivation. One fact generally holds good, and that is that many people find more pleasure in succeeding with a comparatively indifferent plant that is out of its element, than in growing many of our most gorgeous flowers when they require neither thought nor care, but flourish because Nature has done all that is necessary.

Very many of the following kinds have been grown successfully by the writer in the vicinity of Nairobi at an elevation of 5,600 ft., and there is every indication that many others will succeed in the same area if precautions are taken as to shade and moisture.

For the sake of reference the bulbs are given under the heads of their different families, and to keep this very wide subject within reasonable limits, the descriptions have been very curtailed or eliminated excepting in the cases of some which are already popular in Kenya. Many others are given with a view rather to suggesting what bulbs may be suitable than indicating what will be suitable, and their inclusion is not necessarily a guarantee of outstanding merit.

The elevations above sea-level refer generally to Kenya, and if they are used in adjoining territories the degrees of latitude must be taken into consideration, deducting, say, 500 to 600 ft. for every two degrees of latitude.

AMARYLLIDACEAE

Many of the Amaryllids are amongst those popularly known as 'Lilies,' although neither Lilies nor belonging to the natural order Liliaceae. As examples of these we have 'Belladonna Lily,' 'Eucharis Lily,' 'Guernsey Lily,' 'Scarborough Lily,' 'Spider Lily,' etc. A number are natives of South Africa; some are indigenous, *i.e.* found naturally in Kenya, and the majority are suited to most districts of the Colony either because they originate from countries of similar climatic conditions or because of their adaptability.

Alstroemeria. Chilean tuberous plants, of which *A. aurantiaca* having orange flowers grows luxuriantly between 7,000 and 8,000 ft., and *A. haemantha* (*chilensis*) having blood-red tubular flowers tipped green grows equally well between 5,000 and 6,000 ft. Propagated by seeds and tubers. *Bomarea* is a similar plant but of twining habit; see page 121.

Amaryllis Belladonna. This is best suited to districts of 7,000 ft. and upwards. There are several varieties, colours pale pink, whitish, flesh and striped. *Amaryllis* hybrids are referred to below under *Hippeastrum*.

Clivia (syn. *Imantophyllum*). South African bulbs with strap-like leaves and large umbels of handsome flowers. They have flowered in Nairobi when the root run is restricted, also when given ample room and plenty of manure. They are more suited to cooler districts. Seeds or division.

Crinum. All the Crinums do well in shade or sun and in all localities. Many are indigenous, and others native to East Africa generally, including Zanzibar. One of the best known is the red striped species. A creamy white variety is very fragrant.

Cyrtanthus. These South African bulbs are known by the native name 'Ifafa Lily.' They have attractive heads of drooping tubular flowers in a wide range of colours, including white, cream, canary yellow, pink, red, scarlet and apricot. Some are in bloom almost throughout the year.

Eucharis grandiflora. The ‘ Eucharis Lily ’ is a South American bulb which should have shade, and grows between 5,000 and 6,000 ft. Offsets.

Griffinia. Allied to *Eucrosia* in leaf and *Lycoris* in flower, this plant will grow in warm districts.

Haemanthus. The ‘ Blood Flower,’ of which there are indigenous forms, grows throughout the greater part of the African continent. The large pincushion-like heads appear before the leaves. Fresh seed and offsets.

Hippeastrum. Although this is now distinguished from *Amaryllis*, the two are often confused. They are very similar in appearance, but do not hybridise one with the other. *H. equestre*, of which there are two varieties, reddish orange and scarlet, both with green markings, grows very well between 5,000 and 6,000 ft., *Hippeastrum* hybrids and *Habranthus* do best from 6,000 ft. upwards, but with shade are easily grown under warmer conditions. Seeds and offsets.

Hymenocallis. The ‘ Spider Lily ’; closely resembles *Pancratium* which is known as the ‘ Sea Daffodil.’ Both are prolific and grow freely in all districts, producing, with the rains, masses of delicate and short-lived white flowers. Seeds and offsets.

Ismene. The ‘ Peruvian Daffodil ’; is allied to *Hymenocallis* and is suited to the higher districts.

Ixiolirion. The ‘ Ixia Lily ’; an Asiatic bulb, is only suited to cool districts. It produces white, sky blue, or purple flowers, and *I. montanum* is taken by some to have been the ‘ Lily of the Field.’ Seeds and offsets.

Leucojum. *L. aestivum*, the ‘ Snowflake ’ or ‘ Cape Snowdrop,’ grows freely under shade from 5,000 ft. upwards. The flowers are tipped green and resemble the Snowdrop. Offsets and seeds.

Lycoris. These bulbs are allied to *Vallota*, but originate in China and Japan. The colours of the flowers are flesh, yellow, pink, carmine and striped, the leaves greyish. They are the best grown from 6,000 ft. upwards.

Narcissus. This class includes Daffodils and Jonquils amongst the many species. They will bloom at 5,600 ft., but are satisfactory only at elevations over 7,000 ft. where they grow freely and increase.

Nerine. A large genus of South African bulbs allied to *Brunsvigia* and producing umbels of beautiful pale pink to scarlet flowers; best suited to elevations over 6,000 ft. *N. sarniensis* is the 'Guernsey Lily.' *N. undulata*, with small and dainty pink flowers, blooms regularly several times a year at 5,800 ft. *Brunsvigia* from seed is slow at 5,600 ft.

Sprekelia formosissima (syn. *Amaryllis formosissima*). The scarlet 'Jacobean Lily' or 'Malta Lily' is a strikingly beautiful flower. The bulbs are suited to all districts. Offsets.

Vallota purpurea. This Cape bulb is similar to the *Amaryllis*, and is known as 'The Knysna Lily,' 'The George Lily' or 'The Scarborough Lily.' It is very slow if grown below 6,000 ft.

Zephyranthes. A white pink-flushed variety is known as 'The Atamasco Lily.' *Z. candida* is white and known as 'The Swamp Lily.' *Z. carinata* (pink), *Z. flava* (golden yellow), and *Z. rosea* (red), are the best known, and are suited to all districts. They multiply freely, springing up whenever there is an inch or two of rain, at which times each of the very numerous bulbs produces its attractive and somewhat crocus-like flowers followed by narrow succulent grass-like leaves. Offsets.

ARACEAE

The Caladiums and Callas are the most popular members of this order, which includes a great number of plants that in warm and dry countries are grown as verandah plants, or in 'grass' or 'shade houses.'

Caladium. The Caladiums, foliage plants allied to Colocasia, are suited to hot and damp districts from sea level to 5,000 or 6,000 ft. Division.

Calla aethiopica (syn. *Richardia africana*). The white

'Arum Lily'; grows in all districts. *R. Elliottiana*, yellow with spotted leaves, and *R. Pentlandii* flourish from 7,000 ft. upwards, but with shade and moisture may be grown from 5,000 ft. Seeds and division. *R. Rehmannii* from Swaziland, South Africa, grows well between 5,000 and 6,000 ft., and will doubtless be found suited to higher elevations. The blooms vary from whitish tinged rose-purple to a deep rich wine colour, changing with age. Seed.

Monstera. The best known is *M. deliciosa*, a very handsome rhizomatous plant, with large ornamental perforated leaves and a cone-like edible but spiny spadix. It is best grown on an old tree-stump under shade and near water; from the Coast up to at least 6,000 ft. Seed or cuttings.

BEGONIACEAE

Begonia. The tuberous and rhizomatous Begonias grow without difficulty in all districts, either as pot plants or in sheltered positions. They do excellently under the indigenous tree *Ficus Hochstetteri* (Mugumu); but the tuberous species are probably most popular as pot plants. Cuttings, seeds, or division.

BROMELIACEAE

The ornamental Pineapples and Billbergias are best known as pot plants. *Ananas sativus* var. *striatifolius* with longitudinally marked leaves of primrose, red, and deep green, has grown well as a pot plant in Nairobi; suckers. *Billbergia nutans*, producing flowers which are green and blue with rosy bracts, also does well near Nairobi. Other species appear to prefer cooler conditions and all require shade; suckers or offsets. The other members of this order include *Achonea*, *Bonapartea*, *Caraguata*, *Nidularium*, *Tillandsia*, and *Vriesia*, most of which are suitable as pot plants and require humid conditions.

COMPOSITAE

The Dahlia is the outstanding member of this order.

Dahlia imperialis. The 'Tree Dahlia' is a striking garden plant up to 8 and 12 feet in height, and produces a long succession of dependent bell-shaped flowers in spreading panicles, white flushed with purplish rose.

Dahlia variabilis. This is one of the parents of the deservedly popular garden varieties. Other species are being used to produce new forms. Of all the garden bulbous plants the Dahlia is the most widely grown, and is propagated by seeds, cuttings, or division of the tubers. Dahlias respond freely to feeding with 'boma' manure and moist conditions, growing to perfection in most districts. Apart from moles, field mice, and turkeys, they have few enemies, and if the seedlings which spring up round the original tubers are eradicated, the popular belief that they deteriorate and change their colouring will be seen to be fallacious.

For garden decoration few plants are so easily grown or so effective; and for exhibition their flowering period can be controlled; moreover it is not necessary to have scientific knowledge and experience in order to produce exhibition blooms. For use as cut flowers, varieties which keep well and have stiff stems should be selected.

The following list of garden and exhibition types is given with a short explanation, but the names of the varieties are legion and any list must soon be out of date.

Anemone-flowered Dahlias have single clematis-like flowers with quilled centre.

Charm Dahlias are miniature peony-flowered Dahlias.

Collarette have, like single Dahlias, eight petals, but each has a tuft or collar of secondary florets.

Decoratives embrace many nondescript forms, the giant types having broad flat florets full to the centre. They belong neither to the show class nor to the Cactus group.

Double or Show Dahlias are of the round old-fashioned symmetrical type.

Fancy varieties differ from the Show Dahlias in being either tipped or striped with colour.

Mignon or **'Tom Thumb' Dahlias** represent a class of single dwarf Dahlias about 12 inches in height and of bushy habit.

Peony-flowered are semi-double with irregular informed and somewhat flat florets.

Pompon Dahlias are the very small round or globular varieties.

Rosette Dahlias are suggestive of rosettes.

Single Dahlias should have 8 florets, and for exhibition should not be too large ; five inches is the limit. The class comprises the self or shaded type, fancy type, and single cactus with quilled or pointed petals.

Star Dahlias are a form of single Dahlias.

GERANIACEAE

Oxalis, Wood Sorrel. 'Cape Shamrock' of South Africa. Some of the two hundred odd species of *Oxalis* are worth growing, but care should be exercised as many become persistent weeds, the tubers increasing and spreading rapidly. *O. adenophylla*, from Chile, is suited to cold conditions. *O. cernua*, the 'Bermuda Buttercup,' *O. purpurata*, *O. corymbosa* and *O. latifolia* will thrive under warmer conditions. The last three are to be avoided. *O. floribunda alba* is attractive among rocks. *O. lasiandra*, crimson flowered, with cut leaves, is one of the best. *O. Deppei*, with handsome rose-pink flowers and red-banded leaves, is grown in Europe as a vegetable and *O. crenata* in Peru for the same purpose, both tubers and leaves being used, the latter uncooked.

GESNERACEAE

Achimenes. These can be grown in all districts either as pot, basket or border plants, and should have shelter from sun and rain ; seeds, cuttings and tubercles.

Gloxinia should have moisture during the growing period, as well as shelter from the sun.

GRAMINEAE

Andropogon, 'Lemon Grass,' *Cortaderia argentea* (syn. *Gynerium argenteum*), 'Pampas Grass' (seeds and division), and many other rhizomatous plants are very effective. especially near water, and will grow in most districts.

Arundo donax 'The Danubian Reed,' *Arundinaria alpina* the common bamboo of the Colony, as well as the tall and dwarf bamboos all grow easily and are most ornamental, especially the variegated and giant types, All require much room and are suitable for large gardens only. Division.

HAEMODORACEAE

The Blood Worts include *Liriope* and *Ophiopogon spicatus*. Some are useful as waterside plants.

IRIDACEAE

This order includes a very great proportion of South African gladiolus-like bulbs. Many are rather small, but most are very pleasing and useful for cutting as well as for growing in garden borders and waterside positions.

Babiana, Ixia, Schizostylis 'The Kaffir Lily,' *Sisyrinchium, Sparaxis, Streptanthera, Tritonia,* and many allied species are all small South African bulbs of similar habits. They grow freely from 5,600 ft. upwards, and between 5,000 and 6,000 ft. should have sheltered and moist positions. All are attractive, and *Tritonia* is rather more showy than *Ixia* or *Sparaxis*. They are suitable subjects for pot-planting or sheltered garden borders ; seed and offsets.

Anomatheca (syn. *Lapeyrousia cruenta*). Dwarf ixia-like plants from South Africa, flowers deep rose-pink with crimson blotch ; very charming and easily grown in shade from 5,500 ft. upwards. Seed.

Antholyza. These also are South African plants, varying in colour, according to variety, from yellow to scarlet. They are similar in growth to *Montbretia* and require much the same treatment. Offsets.

Crocus. The Crocus family is a very large one, and some species can possibly be grown in the cooler districts. Seeds and offsets.

Dierama. The 'Cape Harebell' is allied to *Sparaxis*. The varieties *D. pendulum*, white to mauve-purple, *D. pulcherrimum*, blood-purple, and *D. album* are tall grass-like plants with funnel-shaped flowers carried on taller thin wiry stems. They grow freely from 5,000 ft. upwards. Seeds and offsets.

Freesia. This sweet-scented flower and its coloured hybrids do well at all altitudes over 5,600 ft. Flowers well in full sun provided it is watered during the growing period.

Gladiolus. The Gladioli originally came principally from South Africa. There are about 150 species, and four distinct tall-growing garden races were produced—viz. *Gandavensis*, *Lemoinei*, *Childsii*, and *Nanceianus*. After the introduction of *G. primulinus* in 1902 a new race with beautiful colours and light open spikes has been developed. The last named have been chiefly bred from a yellow-flowered species from Tropical Africa. Many beautiful and vigorous types may be seen in their wild state in various parts of the country, from the coastlands to the higher slopes of the great mountain ranges. The Primulinus varieties may be distinguished by the hooded top section of the flowers. Propagation is by seed and by small bulblets or spawn produced about the bases of mature corms ; but the prices at which well-grown corms can now be bought enable us to avoid much delay and to have large blooms six or seven weeks after planting.

The corms may be lifted and stored for a limited time, this method facilitating the removal of bulblets and preparation of the ground. Deep planting is advisable and protection from rodents essential. Porcupines may soon demolish a large bed of valuable corms when once discovered. Gladioli are well suited to all districts.

Gladioli, in common with many other plants, when grown in quantity are more likely to suffer severely from insect and fungoid pests than is usually the case with a few scattered specimens. For this reason, particularly as we have no winter nor prolonged dormant period, it is necessary to adopt measures of control, otherwise one's garden may become badly infected. The following are some of the common pests and the remedies prescribed for their control.

Gladiolus Fly. This is a small black fly which deposits its eggs in the flower spike. All withered spikes should be cut and burnt ; the ground being dug over with a view to destroying any of the pupae which may have been released. The larvae may easily be detected on slitting open the withered spike.

Spray the plants with the following :—

Arsenate of lead powder . .	1½–2 oz.
Cheap sugar or jaggree . . .	2½ lb.
Water	4 gallons

Also suspend protected tins of similar bait near the plants.

Red Spider. The application of a miscible oil spray to which has been added 1 to 2 oz. of liver of sulphur, or sprays made as usually prescribed of pyrethrum, nicotine, or quassia extracts are advised. Quassia extract and soap, or hot soapy water, applied with a syringe, is sometimes effective.

Stalk-boring Insect. The treatment advised for Gladiolus Fly may prove efficient.

Thrips. The Thrips (of which there are many species) is a small insect, less than $\frac{1}{25}$ inch in length but most destructive. It usually appears under dry conditions and is difficult to deal with, as its movements are quick and it finds protection from contact-sprays amongst the folds of the leaves, flower-spikes, and even on the corms. Nicotine and soap or oil-spray are usually advised. A strong jet of water dislodges it and may be of use in the early stages.

A mixture of lime sulphur and nicotine extract is often employed. Nicotine combined with a miscible oil-spray is usually considered as effective as any, but it is important to deal with the pest before it gets too great a hold. Thrips generally feeds upon the undersides of the leaves. Dusting with powdered tobacco (Scotch snuff) and pyrethrum powder, or spraying with pyrethrum extract is also resorted to. Dusting with powdered sulphur and lime is sometimes done.

Unfortunately there appears to be no certain cure for thrips on Gladioli, and if the pest gets a footing all remedies generally employed seem unavailing. As the pest exists on the dormant corms it is important that these should be fumigated or otherwise treated before planting. Soaking the corms in a solution of corrosive sublimate in the proportion of 1 oz. to 8 gallons of water has lately been recommended.

A control spray which has proved satisfactory elsewhere and has been passed on for the benefit of others is made up as follows :—

Paris green	1 oz.
Brown sugar	2 lb.
Water	3 gallons

The spray should be kept agitated while being used.

Mildew. If plants show any signs of mildew they should be dusted with sulphur, dry lime sulphur, or Bordeaux powder. In cool or dull weather spraying the plants with Bordeaux mixture, lime sulphur or liver of sulphur (potassium sulphide) is more efficacious, as a high sun temperature is necessary to make the ground sulphur of use. The last mentioned is simple and effective :—

Potassium sulphide . . .	1 oz.
Water	2–2½ gallons

Dissolve the potassium sulphide in a quart of hot water and make up to 2 or 2½ gallons.

Rust. Any appearance of this fungus should, as in the case of mildew, be dealt with at once. Bordeaux mixture and lime sulphur sprays are usually advised, and the measures advised to be taken against mildew may equally well be employed.

Iris. The Iris genus, comprising bulbous and rhizomatous kinds, numbers like the Gladiolus over 150 species, and excepting *Moraea*, which cannot truly be called an Iris, is confined to the Northern Temperate zone. In Kenya nearly all are best grown between 7,000 and 9,000 ft. Those which grow freely below 6,000 ft. include *I. germanica* and the 'Japanese Iris' (*Iris fimbriata*); both require either shady or moist situations. Many of the species hybridise readily, and those seen in gardens are usually of hybrid origin. The herbaceous species are propagated by suckers and division of their fleshy rhizomes; bulbous species by offsets; and all by seeds.

Iris chinensis is referred to above as *I. fimbriata.*

Iris Kaempferi (syn. *I. laevigata*), 'The Japanese Flag,' is said to do well at 7,000 ft.

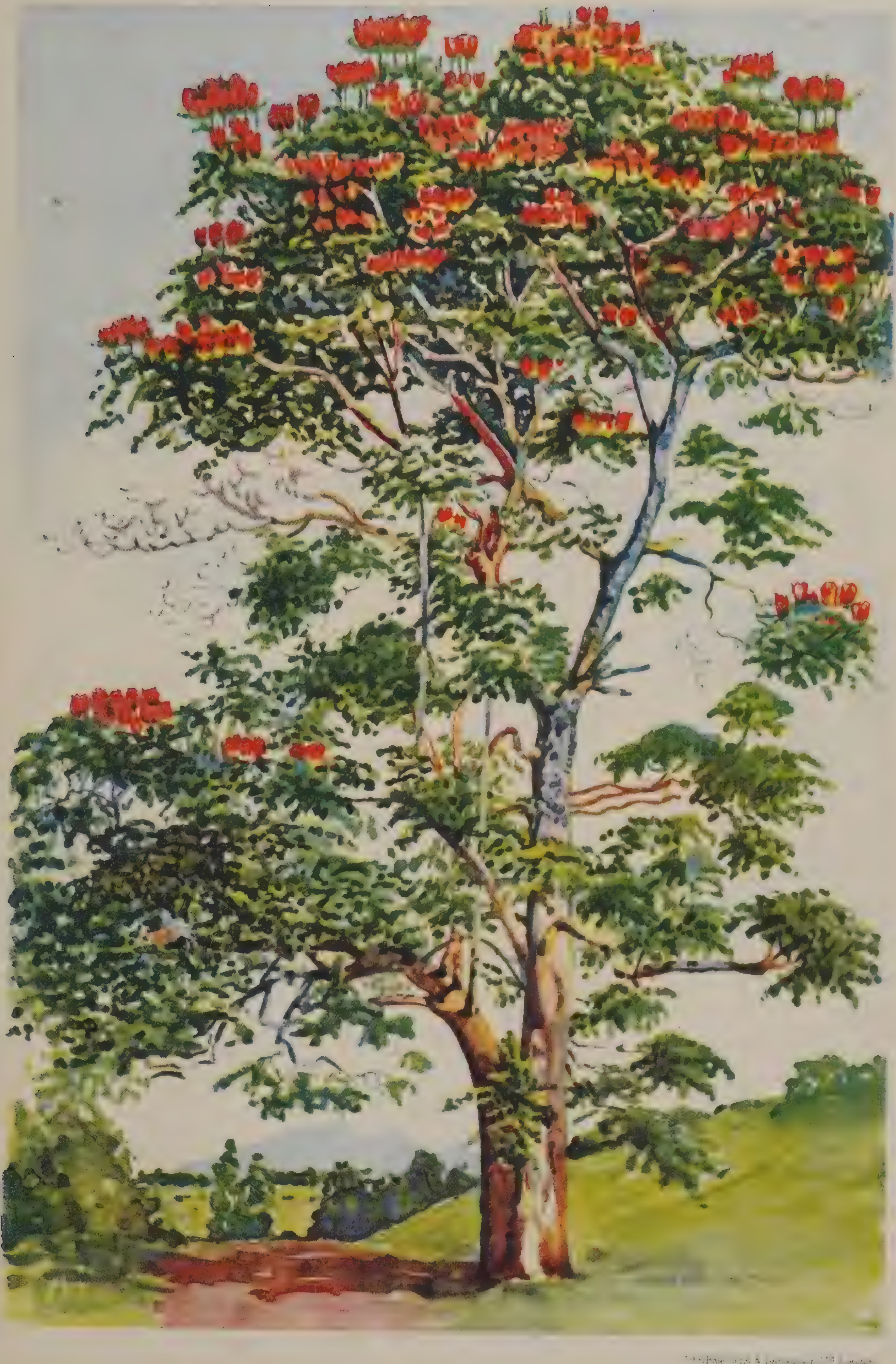
Iris susiana. The 'Chalcedonian,' 'Widow,' or 'Mourning' Iris will bloom at 5,600 ft., but the mortality is severe and it should be grown at higher elevations. It is very satisfactory near Gilgil, and, in fact, in most gardens above 7,000 ft.

Iris xiphioides, the 'English Iris,' and *I. Xiphium*, the 'Spanish Iris,' do very well from 7,000 ft. upwards.

Libertia. Bulbs comprising species from Australia, New Zealand and Chile, nearly all of which are white-flowered; should grow satisfactorily from 6 000 ft. upwards. Seeds and offsets.

Marica gracilis. Grows with a fan of sword-like leaves; white flowers beautifully painted with blue and brown are produced from the edges of the leaves. When the flower is over young leaves form at this point, and if this portion of the leaf is cut off and planted in sand it makes roots readily.

Montbretia. This South African Gladiolus-like plant grows freely between 5,000 and 6,000 ft., preferring sheltered



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SPATHODEA NILOTICA.

See page 159.

and moist positions, but is even better under cooler conditions. The corms should be lifted periodically for the purpose of thinning out the plants. The usual colours range from crimson to orange. Seeds and offsets.

Moraea. The 'Cape Iris.' *M. Thomsoni*, pale lilac spotted brown is indigenous; *M. iridioides*, with dark rush-like foliage, stiff stems bearing a succession of white flowers with mauve, brown and yellow markings, does well in all districts over 5,000 ft., and is best near water or under shade. Seeds and division.

Tigridia. These Mexican bulbs, sometimes called *Ferraria* or the 'Tiger Flower,' include the well-known *T. pavonia.* Their large red, orange, white or purple flowers are short lived but very striking, the spotted centres being reminiscent of leopard markings. Seeds and offsets; to save time offsets may be purchased.

Watsonia. Many beautiful species of these Gladiolus-like South African bulbs are to be seen wild in profusion from Cape Town to Natal. Many garden hybrids have been recently produced. All grow freely in this Colony from 5,000 ft. upwards, requiring moist and shady positions in the warmer areas, *i.e.* below 6,000 ft. *W. Ardernei*, *W. iridifolia*, *W. marginata*, *W. Meriana* and *W. rosea* are amongst those which have done well.

LILIACEAE

This important order comprises a number of highly prized ornamental plants, of which the Liliums or true Lilies have not yet taken their rightful place in Kenya gardens.

In addition to the true Lilies there are many rhizomatous and other bulbous-rooted members of the natural family *Liliaceae* of widely different habit, from Agapanthus and Aloes to Tuberoses and Yuccas, which should all find ideal conditions in this country of varying conditions of soil and climate.

Many so-called Lilies are not Lilies although they belong to the family *Liliaceae.* Examples of this may be found in the names 'The African Lily,' 'Saint Bernard's Lily,' 'Saint Bruno's Lily,' 'The Mariposa Lily,' 'The Toad Lily,' 'Day Lily,' 'Torch Lily,' and 'Berg Lily.'

Agapanthus. The 'African Lily' is one of the most ornamental and easily grown. Like most plants in this dry land it prefers moisture, but will grow in shade or sun, in dry positions, and in all districts. It has few if any enemies; its strap-shaped leaves are always pleasing and the tall heads of the blue or white flowers are very striking. There are many varieties of *A. umbellatus*, large, small white, dark pale, double, variegated, etc.

Allium. Some of the many garden varieties including *A. fragrans* from Mexico, white; *A. neapolitanum*, pure white; and *A. Moly* var. *luteum*, bright yellow, are best suited to districts over 6,000 ft.

Aloe. Aloes seem far removed from our subject, but they belong to the natural order *Liliaceae*. They are found throughout Africa, and their brightly coloured flowers ranging from pale yellow and coral to orange and dark red, with their fleshy leaves, are useful for rock work or planting in stony and otherwise useless positions. Between 5,000 and 6,000 ft. they may grow more vigorously when they are not entirely exposed to the sun, or when their roots can find the protection of rocks, etc. Seeds and cuttings.

Anthericum. 'Saint Bernard's Lily' and *A. Liliastrum* (syn. *Paradisea Liliastrum*), 'Saint Bruno's Lily,' both having white flowers, are two of a varied genus of white and yellow flowered herbaceous tuberous plants. Many are from South Africa and some are indigenous. Seeds, suckers and offsets.

Asparagus. There are many ornamental species, some of which are indigenous. *A. medeoloides* from South Africa is known as Smilax.

Aspidistra. Too well known to need description; grows without difficulty in all districts. It requires shade. Seeds and division. There are several species, all are natives of either China or Japan.

Brevoortia, Brodiaea and **Triteleia** are allied plants requiring the same treatment as *Ixia*, page 135. Seeds and offsets.

Calochortus. The 'Mariposa Lily' or 'Star Tulip' from North America is difficult to grow below 6,000 ft., but will flower there for one season. They are nearly all natives of California and allied to Tulip and Fritillaria. Seed and offsets.

Chlorophytum. These South Central and East African evergreen plants can be grown without difficulty in all districts as pot plants or in sheltered positions. Seeds, suckers and offsets.

Cordyline. 'The Club Palms,' chiefly from Australia and New Zealand; are allied to *Dracaena*, and are useful where palms cannot easily be grown. Suckers.

Dasylirion. A Mexican evergreen species requiring the same conditions as ornamental Bromeliads (page 137); has thick woody stems and large heads of elegant leaves. The flowers are borne in panicles on stems 10 to 12 feet in height. Seeds and offsets.

Dianella. Blue-flowered bulbs from Australia and Tasmania, 2 to 5 feet. Seeds and division.

Dracaena. These palm-like plants are easily grown. *D. fragrans* is indigenous and plentiful in the neighbourhood of Nairobi. A smaller species with narrow glaucous foliage is found in the Kedong Valley, and a very straggling species in the Uplands Forest. *D. Draco* from the Canary Islands was grown near Nairobi, but had a short life compared with one of the same variety growing near Laguna, Teneriffe, said to be over two thousand years old. Seeds and suckers.

Gloriosa. Many species are indigenous; *G. virescens* is very plentiful in the Nairobi district. With the advent of the rains its tuberous but poisonous roots produce slender climbing lily-like plants. The leaves are whorled and tipped with a spiral tendril, the flowers scarlet and yellow (page 123).

Hemerocallis. The 'Day Lily' is easily grown in all districts, by the waterside or in any part of the garden, either in sun or shade. According to variety they are single or double, large or small, bronze, golden or citron yellow. Division. The small citron yellow variety is propagated by either seeds or division.

Hyacinthus. The Hyacinth may be flowered in Nairobi, but is best grown at elevations over 7,000 ft. If grown below this it is as well to flower the bulbs in coconut fibre. Roman Hyacinths are likely to do better than the florist's varieties.

Kniphofia or **Tritoma.** The 'Red-Hot Poker,' or 'Torch Lily,' is suited to all districts and all conditions of shade, sun or moisture, Many species may be found in their wild state throughout this continent.

Lachenalia. African bulbs producing lasting and attractive flowers. Given an abundance of water most of the species will thrive from 5,000 ft. upwards, doing better as pot plants. They are allied to *Hyacinthus* and *Muscari.* Seeds and offsets.

LILIUMS

In or about the year 1912 the writer introduced a few bulbs of *Lilium longiflorum* var. *Harrisii* of which only seven survived the treatment they received, but their progeny number many thousands. There are other lilies which might have competed with them had one but had the foresight to grow them. Many indeed have since been grown successfully near Nairobi, and while in some cases the bulbs have failed to appear the second season, in others they have proved permanent, and there is little doubt that at elevations of 6,000 to 9,000 ft. the number can be very greatly augmented.

The following list includes a number of the species but few of the hybrids. The hybrids are not usually as vigorous as the parent plants. Those shown in the first section are growing well between 5,000 and 6,000 ft. and have reproduced themselves by seeds, bulblets or offsets without difficulty. All are stem-rooting.

L. candidum. The 'Madonna Lily' or 'St. Joseph Lily.' Pure white.

L. Henryi. An orange apricot, easily grown Lily from China.

L. longiflorum var. *Harrisii.* The 'Bermuda Easter Lily,' which originated in Japan.

L. philippinense var. *formosanum.* From the Philippines, white.

L. regale. From China and Tibet, white, yellow throat.

L. Sargentiae. From China, white shaded reddish brown outside, yellow throat.

L. speciosum in variety, pink.

L. sulphureum. From Upper Burma, white, sulphur yellow throat.

L. tigrinum.

The following have been grown and flowered by the writer under the same conditions, but there has not been time to see whether they are suited to the climate near Nairobi.

Lilium croceum. From S. Europe. The 'Orange Lily.'

L. dauricum hybrids. From Siberia, rich orange flushed red and spotted.

L. japonicum (*Krameri*). From Japan, pale pink, slender.

L. longiflorum var. *giganteum*, which should not be confused with *L. giganteum* var. *himalaicum.* Pure white.

L. tenuifolium. From Siberia, deep scarlet and very slender.

L. —— hybrid. Golden gleam, apricot.

L. tigrinum simplex.

L. umbellatum. See *L. dauricum.*

The following Lilies are also being grown with those mentioned in the preceding list, but at time of writing the flower buds have not yet opened.

Lilium pardalinum.

L. thunbergianum.

L. tigrinum var. *flore-pleno.*

L. tigrinum var. *Fortunei.*

L. tigrinum var. *splendens.*

In addition to the foregoing there are many lilies which are suited to comparatively warm conditions and may prove suited to the local climate, viz.—

Lilium cordifolium (Japan).
L. giganteum (Himalaya).
L. giganteum var. *yunnanense* (Yunnan).
L. Lowii (Upper Burma).
L. neilgherrense.
L. nepalense.
L. primulinum (Upper Burma).
L. roseum (Himalaya).
L. speciosum (*L. lancifolium*, Japan).
L. Wallichianum.

Some are doubtless rare and difficult. There are Lilies which grow without difficulty in other countries and include the following, viz. :—

Lilium Batemaniae.
L. Brownii.
L. Maximowiczii (the red variety of *L. Leichtlinii*).
L. monadelphum.
L. superbum.
L. testaceum.
L. Willmottiae.

Lilium Brownii bulbs planted by the writer some months ago have with others failed to grow. Imported bulbs which fail are not necessarily unsuited to the local conditions.

Whoever is experimenting should be careful to ascertain the requirements of the bulbs planted. Some require perfect drainage. The roots of others must have access to moisture although growing in soil which is not too wet, being usually found on the banks of streams. Some require sunlight with heavy mulching, and others must have shade. Many resent disturbance and do not thrive until thoroughly established. When purchasing the bulbs it should be possible to obtain details of cultural directions.

Muscari. ‘ The Grape Hyacinth ’ grows excellently at 8,000 ft. ; given shade and moisture it is suited to lower elevations.

Ornithogalum species. These include the ‘ Chincherinchee' of South Africa and the 'Star of Bethlehem.' Many of the species thrive between 5,000 and 6,000 ft. *O. arabicum*, white flowers with black eye, blooms more freely at higher elevations and some shade is advisable. *O. lacteum*, the flowers of which are exported from South Africa, is milk white. *O. nutans* has silvery-white and green flowers. *O. umbellatum*, pure white flowers. Some of the yellow-flowering varieties are also best grown above 6,000 ft. Seeds and offsets.

Phormium tenax. 'New Zealand Flax' grows in most districts, but is quicker and taller at elevations over 7,000 ft. Division.

Polianthes tuberosa. 'Tuberose.' This highly scented herbaceous plant is suited to most if not all districts, requiring shade and additional moisture below 6,000 ft. Seeds and offsets.

Sansevieria. A genus of fibre-producing plants, many of which are indigenous, interesting on account of their varied aloe-like leaves and peculiar markings. One at least has a tall and striking flower, but in many species the flowers are insignificant.

Smilax. There are many species which grow well in all districts, some being indigenous. Shade and plenty of humus are the chief considerations. Seeds and suckers.

Tulipa. The ordinary Tulip is unsuited to tropical and sub-tropical conditions, and is disappointing at all elevations. Possibly there may be some of the species worth growing.

Yucca. All the Yuccas grow without difficulty, and the following are amongst those which have done well near Nairobi—*Y. filamentosa*, *Y. gloriosa* ('Adam's Needle'), *Y. gloriosa* var. *variegata*, *Y. Whipplei*. *Y. gloriosa* has also been proved at 7,000 ft. Their ornamental foliage and erect stems of graceful whitish bells make them one of the handsomest ornaments of the garden. Seeds and suckers.

NYMPHAEACEAE

Nymphaea. The Water-Lily, with the Lotus and many other fleshy or tuberous-rooted plants, is suited to garden ponds and slow-running streams. There are many suited to the various conditions from the Coast to the coolest districts of the highlands. Some species are indigenous.

ORCHIDACEAE

Orchids are usually divided into two main classes :—

(1) Terrestrial or ground Orchids, and
(2) Epiphytes.

Both may be classed as bulbous, and are referred to elsewhere (page 72).

The following indigenous species of ground Orchids may be mentioned, however, as they are very suitable for planting in the ground in moist and sheltered positions : *Ansellia*, *Calanthe*, and *Lissochilus*. They may also be grown as verandah plants. Division.

PONTEDERIACEAE

This order includes *Eichornea crassipes*, the 'Water Hyacinth,' a pale violet-flowered plant, which though beautiful is apt to become a weed under warm conditions. It grows freely in the swampy land about Durban, Natal. Division.

PRIMULACEAE

Cyclamen. These tuberous-rooted plants have very ornamental foliage, and attractive bright-coloured flowers varying from dark claret, red, and crimson to shades of salmon-pink and white. There are many species and they are easily grown from 5,000 ft. upwards. They should have sheltered and sufficiently moist but well-drained positions. They are also attractive as pot plants. Seeds.

RANUNCULACEAE

Anemones. Comprise herbaceous as well as tuberous-rooted species. Of the former *A. japonica* (syn. *fimbriata*), given shade and moisture, will grow satisfactorily between 5,000 and 6,000 ft., and at higher elevations does exceedingly well. Division. The tuberous-rooted, including *A. coronaria* ('The Wind Flower'), *A. hortensis* and *A. hortensis* var. *fulgens*, are better suited to elevations over 6,000 ft.; below this the tubers only last for a season. They are excellent above 7,000 ft. Seeds and offsets.

Aquilegia, Columbine. The best to grow are California hybrids, *caerulea* hybrids and the long-spurred hybrids. Seedlings usually flower the second year. Below 6,000 ft. they require shade and water. Cuttings and division.

Paeonia. Peonies are disappointing, and unlikely to prove suited to any district. At 5,600 ft. the herbaceous species failed to flower. The roots forced up a growth with the rains for a few seasons and then gave up the struggle.

Ranunculus. The tuberous-rooted varieties grow exceedingly well at elevations of 7,000 ft. and upwards, but at 5,600 ft. have done well enough with light shade and moisture. There are numerous species, but *R. asiaticus*—the garden and florist's type—is the most suitable. Seeds and division.

SCITAMINACEAE

Aframomum is an indigenous rhizomatous plant allied to *Amomum*, ginger and cardamom, having tall handsome pinnate leaves, and dark red flowers followed by similarly coloured seed-capsules produced near the base of the plant. Suited to all districts, but requiring shade or a moist position. Seeds and division.

Alpinia. Like the last these are tall-growing perennial plants with lanceolate leaves. *A. nutans* bears white flowers tinged pink, but they are more for foliage effect than for the flowers, which, though handsome, are too few in number. Moist and shaded positions are the best. Division.

Canna. Many beautiful varieties of this showy garden herbaceous perennial are produced from year to year. Given a good setting they furnish one of the most decorative and easily grown plants. Owing to the rapid multiplication of the fleshy rhizomes it is advisable to lift them each year, replanting only a sufficient number. They are at their best when plenty of moisture is available, but like the Dahlia are effective wherever grown. There are many species, chiefly from Tropical America, including the edible Canna, *C. edulis*, from Peru; but here we are dealing with the garden hybrids, which provide infinite varieties of striking coloured flowers, and foliage which may be tall, dwarf, green or bronze. Seeds and division.

Hedychium. East Indian tall-growing herbaceous perennial plants, with ginger-like roots, lanceolate leaves, and sweetly-scented flowers. By water they grow extremely well, but near Nairobi they grow well enough in shady positions, and probably do so in all districts. As with *Alpinia* the foliage rather overwhelms the flowers. *H. coccineum* has scarlet flowers, *H. coronarium* white and pale yellow, and *H. Gardnerianum* yellow. There are many other species bearing orange, flesh, pink, golden yellow, and greenish flowers. Division.

Kaempferia, 'Galangale.' These (including *K. Cienkowskii*) tuberous-rooted ginger-like plants are found chiefly in Africa, India, Burma and Malaya. The foliage is varied and the flowers of most species are purple. A native of Zanzibar has flowers resembling *Miltonia vexillaria*. *K. Ethelae* from Natal has somewhat larger flowers, and *K. Roscoeana* has rose-coloured flowers with yellow bracts. Division.

Musa. There are several handsome flowering Bananas which are only ornamental, the best known being *M. coccinea* from China, with erect scarlet flowers. It should have a sheltered and moist situation when grown between 5,000 and 6,000 ft. Division. *M. Livingstoneana*, the indigenous Wild Banana, from 5,000 to 8,000 ft., is also very ornamental. Seed.

Strelitzia. South African rhizomatous plants having large ovate leaves on long petioles. The brightly-coloured flowers have a curious shape, which gives rise to the popular name of ‘ Crane Flower.’ The best known are *S. Reginae*, 3 to 4 feet, orange and blue. *S. Augusta* has tall handsome banana-like growth, and indifferent whitish flowers; height, 18 feet. Seeds and division.

Urania (syn. *Ravenala madagascariensis*) is the ‘ Travellers’ Tree ’ with tall banana-like foliage. A large specimen may be seen in the garden of the Conservator of Forests, Nairobi. It makes a handsome avenue. Palm-like plant. Seeds and division. There are several species of *Urania* and *Ravenala*, and all are described as noble plants.

CHAPTER XII

INDIGENOUS PLANTS

Introduction—Flowering Trees—Foliage or Shade Trees—Shrubs—Herbaceous Plants—Ferns—Rock Plants—How to obtain Indigenous Plants.

KENYA has not such a great wealth of remarkable wild flowers as is found in some countries, but she has her fair share of notable species. She also does not lack species which, though they might not be particularly successful in a garden, produce very fine mass displays in their natural habitats. As examples of these might be mentioned the white or pale mauve flowers of Ramphicarpa, which sometimes cover the plains like snow, the sheets of the blue Pentanisia on the plains of the Rift Valley, the acres of the lilac or mauve Vernonia in the Kikuyu country and elsewhere, and similar areas of the large-flowered yellow *Cassia didymobotrya* which rival the finest displays of gorse or broom at home. At higher altitudes one finds the swamps ablaze with Red-hot Pokers (*Kniphofia* spp.) and large areas of moorlands quite yellow or white with Everlastings (*Helichrysum* spp.). The outer edges of the forests are often smothered with the yellow or orange flowers of climbing Senecios, and even in the dry districts the rocky hillsides may be lit up with the red or pink flowers of the numerous species of Aloes. On a small scale, but very striking, are the masses of the little blue or mauve Craterostigma, found in most districts from 5,000 to 8,000 ft., but always on shallow soil, the carpets of the small blue Lobelia seen at its best on Elgon and Mount Kenya, or the blue mists of Plectranthus, which is so abundant in the undergrowth of many forests.

There are many fine plants in the Colony, but they are scattered over such a variety of altitudes, soils and climates that it is hopeless to expect to get all or most of them to grow successfully in one garden. A lot, however, can be done by arranging special conditions in the garden; high altitude plants can be got to grow at much lower altitudes if given appropriate shade and moisture, and some low country plants may succeed at higher altitudes if given shelter.

Wet country plants can often be given sufficient water artificially in a dry district, but dry country plants cannot be given appropriate conditions in a wet district except in a glass-house or under cover. Similarly as regards temperature, it is easier to grow cool country plants in a warm district than *vice versa*. Many plants, however, are very adaptable, and where indications as to suitable districts are given in the following notes it is not implied that skilful gardeners with time and energy to spare should not experiment with them elsewhere.

The number of plants that have some interest or beauty is so large that it is impossible to include them all; and there are also omitted many interesting plants found in inaccessible parts of the Colony and only obtainable with great difficulty.

Trees and shrubs are normally raised from seed, which should be sown in beds or boxes of well-prepared soil; and it is always best to transplant them into other beds or boxes when they are 1 or 2 inches high and have made their third or fourth pair of leaves, and not to leave them in their original seed-bed till ready for final planting out. This encourages the development of the compact fibrous root system rather than a single long bare root, and recovery and growth are then more certain and quick after planting out.

FLOWERING TREES

The following are some of the most striking :—

Calodendron capense (Rutaceae). 'Cape Chestnut.' Medium-sized tree up to 30 feet, with shiny leaves and abundant erect panicles of pink blossom. Flowers frequently but irregularly, sometimes in the wet season and sometimes in the dry. Deciduous at times, but irregularly. Habitat, moderately dry parts of Kenya east of the Rift Valley at 4,000 to 7,000 ft., and extends through Africa to the Cape Colony. Suited to dry, well-drained or rocky sites up to 7,000 ft., but will also grow and flower freely on heavy black cotton soil. Flowers in six to eight years. Needs a background to be seen at its best.

Calpurnia aurea (Leguminosae). 'Kenya Laburnum.' Small tree up to 20 feet, with light green leaves and hanging racemes of yellow flowers like those of a Laburnum, but not so abundant. Deciduous at varying times. Habitat, bush and forest throughout Kenya in moderately moist localities between 6,000 and 8,000 ft. Will do at lower altitudes, but is disappointing in a dry year. Flowers in two years.

Cordia Holstii (Boraginaceae). 'Muringa.' Medium-sized rather crooked tree, with large heart-shaped dull green leaves. Large rounded crown covered with pure white flowers. Very handsome when in flower, but not otherwise. Deciduous in dry seasons. A tree of the warmer, moister parts of Kikuyu and Meru country, 4,000 to 6,000 ft.; also in similar districts west of the Rift Valley (but less common and less well developed). Worth growing for its flowers in all districts between those altitudes, but will only make a fine tree with heavy rainfall. Flowers in three years.

Craibia Elliotii (Leguminosae). 'Mukubu.' A small evergreen tree up to 20 feet, with a dense compact crown of small dark green leaves. Abundant white very sweet-scented flowers, but flowering only lasts about a fortnight. Habitat, forest soils and grasslands at 5,000 to 6,000 ft. Slow growing; flowers in eight to ten years.

Dombeya reticulata (Sterculiaceae). 'Mutoo.' A small tree up to 20 feet, which becomes completely covered with white or pinky-white blossom, generally when bare of leaves, like a wild plum tree. Ordinarily a dull inconspicuous tree, but very striking when in flower. Habitat, grasslands and savannah bush in most rather dry districts of Kenya between

4,000 and 7,000 ft. from the Teita Hills to Mt. Elgon. Worth growing on shallow or rocky soils, but also in better parts. Needs a background to show it off.

Erythrina tomentosa (**Leguminosae**). ‘Flame Tree,’ ‘Corky Bark.’ A small stiff-branched bushy-crowned tree up to 20 feet, with a short corky-barked bole. Deciduous, and when bare of leaves produces spikes of brilliant scarlet blossom at the end of the short stiff branches. Widespread throughout Kenya and a great part of Africa, in grasslands and rocky sites, from sea-level to about 7,500 ft. Slow growing, but should flower in from six to eight years. Worth growing on dry sites and rocky banks unsuited to other trees, but will make a picturesque shade tree in grassland on better soil. A smaller but rather finer species, *E. Humei*, is found in the coast districts and up to about 3,000 ft.

Markhamia Hildebrandtii (**Bignoniaceae**). ‘Mho’ (see Plate III opposite page 96). A bushy tree up to 30 feet, dense dark evergreen foliage, orange-yellow flowers for many months in the year. Habitat, Nairobi to Nyeri districts. Suited to all districts at 5,000 to 6,500 ft., with 25 to 40 inches rainfall. Drought resistant. Long taproot; needs sowing direct or careful planting. Fairly fast in good soil. Makes a good screen or background. Another species (*M. platycalyx*) is similar, but smaller and suited to wetter, warmer districts.

Milletia oblata (**Leguminosae**). ‘Mwangwa.’ Small spreading tree up to 20 feet, with pretty foliage. Deciduous, abundant lilac-coloured blossoms. Usually flowers when bare of leaves, and needs a background. Dry to moist districts, 4,000 to 6,000 ft. Drought and white ant resistant. Flowers in three years.

Spathodea nilotica (**Bignoniaceae**). ‘Uganda Flame Tree.’ Medium-sized and handsome tree up to 40 feet, with rounded crown covered with large bright orange-red flowers. In flower for many months; generally deciduous in dry season. Habitat, Lake Victoria basin, 3,600 to 5,000 ft. Prefers warm moist conditions, but on deep soil stands a good deal of drought. On good soil does well i all districts from coast to 6,500 ft., if not too dry or winc swept. Flowers in three years. Prone to leaf-blister, fc which the only effective remedy is removal of all the affecte leaves. See Plate IV opposite page 144.

FOLIAGE OR SHADE TREES

There are many fine trees, particularly in the mor tropical parts, but only a few of the commoner ones suitec to the Highlands can be mentioned here.

Acacia *spp.* (**Leguminosae**). 'Flat-topped Thorn Trees. Very picturesque trees up to 30 feet, with spreading crown absolutely flat on top.

A. Lahai is very common at 6,000 to 8,000 ft., west o the Rift Valley.

A. xanthophloea, 'Fever Tree,' with smooth green bark in warm country with underground water, 3,000 to 6,500 ft Slow growing and perhaps scarcely worth planting, but tc be taken care of by those lucky enough to have them already in their gardens.

Brayera (Hagenia) anthelmintica (**Rosaceae**). Tree up to 60 feet, with broad-spreading crown, light green foliage, reddish papery bark. Only suited to districts at 7,000 to 9,000 ft.

Croton megalocarpus (**Euphorbiaceae**). 'Mukinduri,' 'Musine.' A very picturesque tree up to 60 feet, with a clean straight bole and brown-leaved flat-topped crown. Dry and moderately moist districts, 5,000 to 7,000 ft. Fairly slow, but grows about 2 feet a year when young. Suited to corners of a big garden.

Dracaena fragrans (**Liliaceae**). 'Dragon Tree.' A large-leaved, dark green, branchy, palm-like tree up to 30 feet. Fairly fast. Picturesque. Stands drought but likes moisture. Good soil, all districts at 5,000 to 6,500 ft.

Ekebergia ruepelliana (**Meliaceae**). 'Mununga.' A large-boled tree up to 40 feet, with a dark green, wide-spreading crown. On good soil in all districts at 5,000 to 9,000 ft., with not too heavy a rainfall. A fine paddock tree.

Ficus *spp.* (**Moraceae**). 'Wild Fig Trees.' There are many species, which may be divided into two types, conveniently distinguished by their Kikuyu names—'Mugumu' and 'Mukuyu.' The former usually starts as an epiphyte in the forks of other trees, from which it sends down long aerial roots which finally establish themselves in the ground; the latter grows in the ground from the start and does not form aerial roots. The Mugumu has small shining green leaves and small berry-like green fruits; the Mukuyu type has larger, dull, brown-green leaves and large red fruits which are edible, though dry and insipid.

The Mugumu type, e.g. *Ficus Hochstetteri*, *F. Thonningii* and others, is the better one to cultivate. It forms a large handsome spreading shade tree up to 40 feet and its leaves make a good mulch. Shrubs and other plants which do not bear full sun do well under its shade. Suited to all altitudes from the Coast to 9,000 ft., excepting very wet districts. Will grow on good soils and also on very poor rocky ones. Deciduous for short periods once or more often twice a year.

Best propagated by means of large cuttings, pieces of straight upright-growing branches 6 to 8 feet long and 2 to 4 inches in diameter. These planted *in situ* during the rains or kept watered will usually root and produce branches very quickly.

Markhamia Hildebrandtii (page 159) is a useful bushy evergreen foliage tree for dryish districts.

Musa Livingstoneana (Scitamineae). 'Wild Banana.' Like an ordinary banana, but with a thicker, shorter stem and very large handsome leaves. Grows rapidly from seed. Habitat, moist shady places, 6,000 to 9,000 ft., but it will grow in fairly dry localities also.

Podocarpus gracilior (Taxaceae). 'Podo.' Perhaps the handsomest tree in Kenya. Large straight-boled evergreen tree up to 80 feet, with shapely crown and fine foliage which shows frequent flushes of bright green young leaves. Habitat on forest soils or on river banks, moderately dry to moderately moist districts, 5,000 to 8,000 ft. Grows $1\frac{1}{2}$ to 2 feet a year on good soils.

Schrebera alata (Oleaceae). 'Mutoma.' Medium-sized tree up to 40 feet, with narrow compact crown and light brown bark. Foliage of a light ash-like green. Small sweet-scented flowers. Good soils, moderately dry to moist districts, 5,000 to 7,000 ft. Grows 1½ to 2 feet a year.

Tamarindus indica (Leguminosae). 'Tamarind,' 'Mkwadju.' Fine shade tree up to 30 feet, with dense dark green rounded crown. Coast districts and dry bush country up to 4,000 ft. Slow but worth growing in warm dry districts.

SHRUBS

Out of a very large variety only a selection of the commoner and more conspicuous ones can be mentioned.

Acanthus pubescens (Acanthaceae). Semi-woody bush up to 10 feet, with large spiny leaves and large upright panicles of pink flowers. Warm, dry to moist, districts at 4,000 to 6,000 ft. Occasionally a white variety occurs.

Acanthus eminens. Similar to the above but with blue flowers, and prefers cool moist conditions and shade.

Adenium coetaneum (Apocynaceae). A succulent shrub with swollen green stems and pretty pink Azalea-like flowers at the ends of the branches. Very large underground root stock. Habitat, arid country from the Coast to 3,000 ft. Will grow in warm dry places up to 6,000 ft., remaining small but flowering freely.

Bauhinia tomentosa and **B. taitensis (Leguminosae).** Low shrubs with graceful light green foliage of small 'camel's foot' leaves. Pretty yellow flowers. Warm and moist, to fairly dry country, up to 6,000 ft.

Carissa edulis (Apocynaceae). 'Mukawa.' A semi-scandent thorny shrub with corymbs of white or pinky-white sweet-scented flowers. Fruits edible. Dry localities at 5,000 to 6,000 ft.

Cassia abbreviata. 'Msoko.' Shrub or small tree up to 15 feet. Deciduous. Abundant yellow flowers when bare of leaves, with strong sweet-pea scent. Very striking.

Habitat, dry bush country. Coast to 4,000 ft. Not yet seen in cultivation.

Cassia didymobotrya (**Leguminosae**). 'Mwena.' Large quick-growing, short-lived shrub, with abundant upstanding spikes of bright yellow flowers. All districts from 3,000 to 8,000 ft., if not too dry.

Clerodendron myricoides (**Verbenaceae**). 'Butterfly Bush.' A compact bush up to 10 feet, evergreen with numerous small very pretty flowers varying from pale to dark blue. Grows in all districts from 3,000 to 8,000 ft. Will grow on dry rocky soil, but flowers more freely in moister sites.

C. zambesiacum. A shrub with round felty leaves and graceful long tubular white flowers. Habitat, the rather warmer wetter parts of the country, from the Teita Hills to Mt. Elgon. Not suited to very dry or cold districts. Has a bad habit of spreading widely by suckers.

Combretum abbreviatum (**Combretaceae**). A very showy scandent shrub which will scramble over tall trees. Produces a profusion of small crimson flowers along the upper sides of the branches. Warm, rather moist places; all districts from 3,000 to 5,000 ft. Will grow and flower up to 6,500 ft., and stand a good deal of drought.

Crotalaria agatiflora (**Leguminosae**). 'Mwethia.' A quick-growing but short-lived shrub up to 10 feet, with abundant large and very striking greenish-yellow flowers. All districts on good soil from 5,000 to 9,000 ft. There are several other species, such as *C. lachnocarpoides*, a hairy shrub with yellow flowers turning orange-red, suited to moist warm districts, and *C. pseudospartium*, a pretty small-leaved shrub up to 10 feet, with a drooping habit and large yellow flowers, for rather dry warm districts, 5,500 to 7,000 ft., which are worth trying if one comes across seed.

Dichrostachys glomerata (**Leguminosae**). Small fine-foliaged smallish shrub, with flowers in pretty little tassels, of which the upper half is yellow and the lower half pink. Dry districts from Coast to 4,000 ft., but in warm situations will grow and flower up to 6,000 ft.

Dyschoriste thunbergiiflora (**Acanthaceae**). Small dense shrub up to 3 feet with abundant blue-mauve flowers. Habitat, dry bush country up to 5,000 ft. Useful in dry hot situations up to 6,500 ft.

Encephalartos Hildebrandtii (**Cycadaceae**). A small short-stemmed palm-like plant with handsome foliage. Habitat, dry bush country near the Coast, but will grow in warm situations up to 6,000 ft.

Gardenia spathulifolia (**Rubiaceae**). Large, compact, stiff-branched shrub up to 20 feet. Abundant large white, scented flowers. Rather dry districts, Coast up to 4,000 ft., but will grow up to 6,000 ft. in sunny situations. Slow growing, probably eight years to flower.

G. urcelliformis. 'Mukombo'kombo.' A large shrub or small tree up to 25 feet. Large trumpet-shaped flowers, white blotched with brown, strongly scented. Large fruits, which hang for a long time, are rather disfiguring. Good soil, moist or moderately dry districts, 4,000 to 6,500 ft.

Grewia similis (**Tiliaceae**). A straggling shrub with small leaves, pretty lilac-coloured flowers, and orange fruits. All districts 5,000 to 7,000 ft., except wet ones. Will grow on dry rocky situations.

Hibiscus *spp.* (**Malvaceae**). Very many species. Individual flowers striking, but whole plant usually not very effective. Species perhaps most worth cultivating are *H. aponeurus*, a small shrub, small scarlet or crimson flowers, all districts from the Coast to 7,000 ft.; *H. panduriformis*, a large spreading shrub, having large felty leaves and wine-coloured flowers, most districts 4,000 to 6,500 ft.; also the deep yellow large-flowered species from the Coast.

Hypericum lanceolatum (**Hypericaceae**). 'Giant St. John's Wort,' 'Sasimua.' Shrub or small tree up to 20 feet, with attractive light green foliage and abundant large yellow flowers. Habitat, damp places at 8,000 to 10,000 ft. Will grow and flower down to 6,000 ft. if given moisture. *H. Schimperi* is a similar species. There are many smaller species, most, but not all, along streams, widely distributed in East Africa.

Jasminum *spp.* (**Oleaceae**). Climbers and scramblers. Many different species in all districts from the Coast to 9,000 ft., all with white flowers and strongly scented. *J. mauritianum* is often found growing on dry hot rocky sites at 5,000 to 7,000 ft., and is useful for such situations in a garden.

Ochna nandiensis (**Ochnaceae**). 'Mungarima,' 'Buttercup Bush.' Small shrub up to 10 feet with handsome foliage and a profusion of medium-sized yellow flowers. Slow growing but flowers early. Fairly good soil in all districts at 5,000 to 7,000 ft. *O. Stuhlmannii* is similar but with smaller leaves and flowers and calyx turning a bright red ; will grow as a bush on dry rocky sites, but makes small tree on better soil.

Oncoba Routledgei (**Flacourtiaceae**). Large spiny shrub or small tree, with dark green leaves and very beautiful large white flowers. Habitat, good soil in most districts with good rainfall, from 4,500 to 6,500 ft. Will grow in dry situations and flower in three to four years.

Pavetta abyssinica (**Rubiaceae**). Rather straggling shrub with heads of long tubular white flowers. Habitat, forest and forest edges, in fairly moist districts, 6,000 to 8,000 ft.

Pentas *spp.* (**Rubiaceae**). Small shrubs with red, pink, or white flowers. Many species from Coast to 8,000 ft. Some of the best are :

P. coccinea, dry and wet districts from 5,000 to 7,000 ft. ; a rather scraggy shrub, but with flowers a fine scarlet which keep their colour.

P. lanceolata, Coast to 5,000 ft., but will grow to 6,500 ft. or more ; flowers scarlet, but turn mauve with age.

P. longiflora, similar habitat, branching semi-woody plant up to 5 feet, with heads of tubular white flowers ; and *P. longituba*, semi-woody, single stemmed, up to 3 feet, with head of long tubular white flowers, found in many districts with good soil and fair rainfall at 6,000 to 7,000 ft.

Phoenix reclinata (**Palmae**). 'Mukindu Palm.' A tall tree in wet districts from the Coast up to 6,000 ft., and along rivers in drier districts. Normally as grown in gardens is a stemless shrub with leaves up to 12 feet long, rising direct from the root-stock ; will grow up to 7,000 ft., and stand considerable drought. Other very handsome local palms are the Palmyra (*Borassus flabellifer*) and Raphia (*Raphia Ruffia*) palms, but these require very special conditions for cultivation.

Ruttya speciosa (Acanthaceae). A small straggling bush, found on the eastern wall of the Kedong section of the Rift Valley and not yet recorded from elsewhere. Abundant red flowers with a black patch in throat, very showy and worth trying in dry or rocky places from 4,000 to 7,000 ft.

Thunbergia affinis (Acanthaceae). A small shrub with abundant purple gloxinia-like flowers, rarely out of bloom. Habitat, the Coast districts, but will grow and flower freely in warm areas up to 6,500 ft.

Thunbergia affinis *var.* **pulvinata.** Similar to the above, but with slightly smaller leaves and flowers. Habitat, the hills at 4,000 to 6,000 ft., between the Coast and the Highlands.

Thunbergia *sp. nr.* **cordata.** A small herbaceous shrub (see page 129).

Tinnea aethiopica (Labiatae). A shrub up to 10 feet, with curious small dark brown almost black flowers which are violet-scented at noon. Found in all districts with fair rainfall from the Coast to 7,000 ft.

Turraea Holstii (Meliaceae). An upright shrub, up to 12 feet, with small leaves and a mass of small white sweet-scented flowers. Will grow on good soil in most districts from 4,000 to 7,000 ft., but needs warm moist conditions to flower freely.

T. mombassana. Straggling shrub, densely covered with small leaves and producing abundant small white flowers. Found in many districts from sea-level to 7,000 ft. Will grow in dry rocky places.

Vernonia *sp.* **(Compositae).** 'Musakwa.' A rather herbaceous shrub up to 12 feet, with large heads of mauve flowers. Flowered stems die back and are replaced by new shoots. All districts with good soil and fair rainfall from 5,000 to 7,500 ft.

There are many other noteworthy shrubs, such as *Coffea eugenioides*, *Doryalis* spp., *Englerodaphne*, *Heinsia jasminiflora*, *Monodora Veitchii*, *Mussaenda odorata*, *Tetracera Boiviniana*, and others of the arid semi-desert regions, that cannot be described for want of space.

HERBACEOUS PLANTS

These are legion, and only the best of those from accessible localities and reasonably easy of cultivation can be described. There are many striking plants from the high moorlands and from the semi-desert regions which must be omitted, and others are described in general terms, as insufficient is known about them to notice each species separately.

Acidanthera candida (Iridaceae). A bulbous Narcissus-like plant which comes up with the rains and disappears for the rest of the year. A delicate, pure white, sweet-scented flower. Found in grasslands in districts of moderate rainfall at 5,000 to 6,000 ft. In the Teita Hills there is a fine red-flowering species.

Canarina *spp.* **(Campanulaceae).** Climbers or trailers growing on old trees or rocky cliffs, in wet forests or damp places, at 7,000 to 9,000 ft., with beautiful pink or orange bell-shaped flowers hanging downwards. Two species, *C. Eminii* and *C. abyssinica*, the latter sometimes found growing on the ground and climbing bushes in fairly dry districts down to 6,500 ft. See Plate V opposite page 192.

Craterostigma pumilum (Scrophulariaceae). Tiny plants which grow gregariously, always on shallow or rocky soil which is frequently moist ; a rosette of leaves pressed close to the earth and pretty little blue or mauve flowers. Will grow in grass lawns like daisies. All districts from 4,000 to 9,000 ft.

Crinum *spp.* **(Amaryllidaceae).** Bulbous plants common on plains and grasslands at all altitudes and often abundant in swamps; very conspicuous, with dense heads up to 2 feet high composed of large trumpet-shaped flowers, white and variously striped with pink. Striking but rather coarse plants; but one species, *C. heterostylum*, from Mt. Elgon, has smaller, more delicate, pure white flowers turning pink with age.

Crossandra *spp.* (**Acanthaceae**). Many species, both shrubs and herbs, with striking individual flowers; but not showy plants. Perhaps the most showy are *C. mucronata*, a woody straggling herb with deep salmon-coloured flowers which grows in dry rocky places, shade or sun, from 5,000 to 7,000 ft.; and *C. subacaulis*, a small primula-like herb which grows in grasslands of fairly dry districts, from 4,000 to 7,000 ft., having leaves flat on the ground and an upright spike of pinkish buff-coloured flowers.

Delphinium macrocentron (**Ranunculaceae**). Herb with single sometimes branching flower-spike up to 6 feet, and flowers of most unusual tints varying from pale to dark bluey-green. Common in grasslands in all districts from 6,000 to 8,000 ft., with fair rainfall.

D. candidum. A bushier plant with white, sweet-scented flowers. Grows in rather warmer areas, such as the North Kavirondo and Kilimanjaro districts, 4,000 to 6,000 ft.

Dierama cupuliflorum (**Iridaceae**). 'Wind Flower.' Bulbous plant, growth like a Watsonia, with numerous pink flowers hanging on thread-like stalks. Found in grasslands at 8,000 to 10,000 ft.

Gladiolus *spp.* (**Iridaceae**). Several species which, though beautiful, are not of course so gorgeous as the latest garden hybrids. The finest is the deep red species (*G. Mackinderi*) from the Aberdare moorlands at about 10,000 ft., with as many as six to ten flowers to the spike. The commonest, which grows in grasslands in most districts from 5,000 to 8,000 ft., varies from pink through yellowish-pink to yellow.

Gloriosa. See page 123.

Haemanthus multiflorus (**Amaryllidaceae**). 'Fireball.' Bulbous plants with globular heads of brilliant scarlet flowers. Flower-heads usually appear just before the rains, and are followed later by the leaves. Plant eventually dies down and disappears till the next flowering; this may happen two or three times a year. Found usually in the shade of bush or forest, at all altitudes from the Coast to 8,000 ft., except very wet districts. If introduced into shrubberies soon establish themselves and spread. Can be grown in tubs or pots with other plants. Flowers only last about ten days.

Hebenstretia dentata (**Selaginaceae**). Small woody herb with spikes of white flowers having a vermilion patch in the throat, scented in the evening. Common on the drier sides of most of the mountains and escarpments from 7,000 to 12,000 ft. On the higher moorlands grows into large heath-like bushes. Will grow and flower well at under 6,000 ft.; it is then only a biennial but seeds itself freely.

Impatiens *spp.* (**Geraniaceae**). 'Balsams.' Many species varying from 1 foot to 5 feet. Rather succulent shade-loving plants, with white or various shades of pink or red flowers. Common in the undergrowth of the wet or moist forests from 6,000 to 10,000 ft. A fine species only found near water is *I. elegantissima*, up to 5 feet high with large white flowers pink-spotted and sweet-scented. The finest indigenous species is possibly *I. Oliveri*, a succulent shrubby plant up to 3 feet, with large fleshy orchid-like flowers that are pure white with delicate pink markings; this is found on the bare rocky, frequently mist-covered summits of the Teita Hills at 5,000 to 7,000 ft.

Kniphofia *spp.* (**Liliaceae**). 'Red-Hot Pokers.' Several species, but all very similar. In wet grasslands and abundant in swamps, at 7,000 to 10,000 ft., but also found on dry hillsides in some districts. Bulbous plants, with erect spikes of red and yellow flowers.

Orchids (**Orchidaceae**). Very numerous species of both terrestrial and tree Orchids. Ground Orchids are found in the grass, bush and forest lands of all districts from sea-level to 11,000 ft. Perhaps the most striking is *Lissochilus porphyroglossus* (see Plate VI, opposite page 240), with flower-stems up to 7 feet high and heads of purple-mauve flowers, growing in swamps in many districts between 5,000 and 7,000 ft. Several other *Lissochilus* species occur in swamps and grasslands, smaller plants, but often very pretty. If it is not too dry they will grow in an ordinary flower-bed.

The grasslands Orchids have usually close-set spikes of small flowers, which may be white, red, pink, yellow or green.

Deroemera pentadactyla is an elegant little plant with small pure white flowers set all on one side of the flower-spike, found on the Aberdares, Mt. Kenya and Mau at 9,000 ft. One or two species of *Disa*, found rather in bush than grass, have larger flowers and are very showy, as is *Calanthe Volkensii*, which grows among the tree-ferns in the moister parts of the rain forests.

Among the tree Orchids there are many species, but not the variety to be found among the ground Orchids. They are, however, quite as widely distributed and even easier to grow in the garden, as species from a great range of districts will flourish if fixed on any forked or rough-barked tree. The majority of species are white, but the most striking is the Leopard Orchid (*Ansellia nilotica*), which has large sprays of orange flowers blotched with brown. This grows abundantly on the Dôm Palms south of Mombasa, and also round Lake Victoria, but it will flower freely in Nairobi at 6,000 ft. Another striking species is the wild Vanilla Orchid, which is a thick fleshy-stemmed climber. The up-country species has large mauve flowers, but the Coast plant has white flowers up to 3 inches across.

Saintpaulia ionantha (**Gesneraceae**). 'African Violet.' Not to be confused with the true Violets, *Viola abyssinica* and *V. Eminii*, which grow abundantly at higher altitudes. A beautiful little plant, best grown in pots with shade and moisture. Fleshy leaves, upper surface green, lower red; flowers of a fine purplish-blue. Rare in Kenya; only found in the wet forests near the Tanganyika border.

Streptocarpus *spp.* (**Gesneraceae**). These are little scrambling fleshy-leaved moisture-loving plants. *S. ruwen-*

zoricus is common in the wetter forests at 7,000 ft., and has small deep mauve flowers. More striking are *S. caulescens* with lovely spikes of deep mauve-purple flowers, found in the bush of the Teita Hills, 4,000 to 6,000 ft.; and *S. saxorum* with thick succulent leaves and large single pale mauve flowers, also from Teita but from rockier and more exposed situations. With shade and moisture these can be grown up to at least 6,500 ft.

Thunbergia. See page 166.

FERNS

Ferns are found in every district from sea-level nearly to the snow-line at 16,000 ft. Given suitable conditions of shelter and moisture, varieties from a great range of altitudes can be grown in any garden. In the few moist low-altitude forests, such as the Shimba Hills, are found climbing ferns clothing the boles of giant trees to 100 ft. and more, and also the remarkable Elkshorn Fern (*Platycerium* sp.). Perhaps the richest areas for ferns are the temperate rain forests on Mt. Kenya and the Aberdares, between 6,000 and 8,000 ft. Here are valleys filled with wonderfully graceful tree ferns (*Dicksonia* sp.), whose 15-feet stems are in considerable demand for hut-building and even for bridges. On the rugged boles of the great Camphor trees is found a great variety, from Filmy Ferns to Stagshorns. The noblest of all the local ferns, *Marattia fraxinea*, is found here by the streams, with fronds up to 12 feet or more from the ground. Maidenhair occurs in moist places in all districts, and a widely distributed though not a very common species is the Royal Fern (*Osmunda regalis*). A very remarkable fern is *Actiniopteris radiata*, which has adopted a xerophytic habit, with needle-like leaves, and is found in dry, hot, rocky, most unfern-like situations.

ROCK PLANTS

In many gardens there are areas of shallow soil or rock outcrops which are useless for ordinary gardening purposes, but can be turned to excellent account if utilised for rock plants or succulents. In most parts of Kenya the wonderful Cactus family from Central and South America can be grown in the open, and with their amazing variety of forms can be an endless source of interest. There is also the marvellous range of succulent and desert plants from South Africa to choose from, but a very fine show can be made with plants indigenous to Kenya. It cannot be said yet that our rock and desert plants are well known, and there is still much room for discovery. Of many of our rock plants the scientific names are not yet fully known, and the following is only a general description of some of the groups of local plants that can be looked for and utilised in making a rock garden.

Aloe *spp.* (**Liliaceae**). Aloes. These fleshy spiny-leaved plants are about the most showy that can be grown on rocky sites. They are found in all districts except very wet ones, generally in dry, sandy, or rocky situations. There are many species, ranging from stemless cushion-plants to many-stemmed dense clumps, and branchy straggling scramblers to single-stemmed tree-like plants up to 15 feet. The very large showy flower-spikes vary in colour with the species, and include pink, scarlet, red, dark red, yellowish-green, yellow, etc. Pieces of these plants root easily, and as they can be carried without special packing for many days before planting without harm, a good variety is easily collected for the garden.

Caralluma retrospiciens (**Asclepiadaceae**). A remarkable plant with prune-black flowers. Stems cactus-like, many angled and succulent, up to 18 inches high, with flowers clustered together in a black pompon at the apex. Found in the sandy deserts of the Northern Frontier District of Kenya Colony.

Euphorbia *spp.* (**Euphorbiaceae**). 'Candelabra Trees.' Large trees up to 40 feet, with dense compact crowns of upright-growing, leafless spiny branches. Several species, some with more horizontal branches and so more open crowns than others. One species commonly used for fences round villages on the Kavirondo plains produces a dense mass of small stems from the ground, which would make a useful hedge or dark background.

Huernia *spp.* (**Asclepiadaceae**). Small succulent leafless plants 2 to 3 inches high, growing among rocks. Curious bell-shaped flowers, green outside and red or purplish-red inside. The commonest species is *H. keniensis.*

Kalanchoe *spp.* (**Crassulaceae**). 'Life Plants.' Small upright-growing plants, with fleshy stems and leaves often silvery in colour, and panicles of small tubular flowers, which are white or various shades of pink, red or orange, according to species. Found at all altitudes in dry situations. Flower-stems from a few inches up to 4 or 5 feet.

Notonia *spp.* (**Compositae**). Succulent plants with flower-heads usually bright crimson or scarlet. The commonest species is *N. Grantii* with fleshy leaves, which grows on dry banks in most districts from 5,000 to 8,000 ft. Another species, *N. Gunnisii*, has no leaves, but underground running roots producing upright fleshy stems at intervals with single terminal flower-heads.

Stapelia *spp.* (**Asclepiadaceae**). Small succulent leafless plants 2 to 3 inches high, rather similar vegetatively to *Huernia*, but more varied in form and with even more striking flowers. The flowers are fleshy and usually star-shaped, from ½ to 5 inches across, with wonderful banded or marbled patterns in dark red, brown or yellow. The flowers have an offensive odour, but are well worth growing in the open for their strangeness and beauty.

There are many other interesting plants to be found on rock outcrops and dry plains throughout East Africa which are well worth looking for and trying out on the rockery.

It may be asked, Where can seeds or plants of these indigenous species be obtained? The answer is that for the most part they have to be collected on chance expeditions, picnics, etc. Some perhaps can be obtained from or through friends or fellow-members of the Horticultural Society, who have better opportunities of travelling about the Colony than oneself. Many of the trees and shrubs can be obtained from the Kenya Forest Department. The latter will also exchange rock plants from the considerable collection in the Nairobi Arboretum, if sufficient of any particular species is available. In any case information can often be obtained from the Forest Department or from the Kenya Horticultural Society as to where and how plants may possibly be obtained.

CHAPTER XIII

LAWNS, HEDGES, ORNAMENTAL FOLIAGE TREES AND SHRUBS

Lawns—Preparation of the Ground—Varieties of Grass used—Planting—Maintenance—Renovation.

Hedges—Boundaries or Barriers—Screens, Windbreaks, Flowering Hedges—Formal Clipped Hedges—Edgings for Borders or Paths—Preparation of the Ground—Maintenance.

Ornamental Foliage Trees and Shrubs—Introduction—Alphabetical List of Trees—Foliage Shrubs.

LAWNS

No garden is complete without grass lawns, which are restful to the eye and provide the best possible setting for flowering plants of all sorts. At the Coast lawns are much more difficult to establish and keep going than they are in the Highlands, owing to the smaller rainfall and the less kindly soil, and one of the finer grasses, such as the Indian dhoob grass or the so-called Uganda grass, does best. But above 5,000 ft. lawns present no difficulty—or rather the reverse, as they tend to grow too freely.

Preparation of the Ground. This should be taken in hand at least six months before the planting, if possible. And the more deeply the ground is broken up—say to a depth of 12 to 18 inches—the better. Unless it is of a swampy nature drainage can be disregarded, except perhaps in the rare instances where it is desired to make a grass lawn-tennis court, bowling green, or cricket pitch; and here the drainage practices employed in England can be carried out. The top 6 inches of the soil must be well broken up and pulverised, in order to facilitate levelling and to enable even settling to take place. A poor soil should be enriched by adding farm or stable manure, with or without the sprinkling of a few ounces of bone-meal per square yard.

If it is desired to have a perfectly level lawn, ground-levelling can be done with a spirit level, straight-edge, and pegs in the ordinary way. In any case surface-levelling should be done with the rake, the object being to get an even and uniform surface. The roller should not be employed at this stage.

Varieties of Grass Used. Lawns can be grown from seed, as in England ; but such are practically unknown in Kenya, where planting out with one or other of the varieties of grass mentioned below will be found easier, quicker, and cheaper. At all altitudes above 3,000 or 4,000 ft. the great majority of lawns are made with the common Kikuyu grass, *Pennisetum clandestinum.* Two other finer grasses that may be employed are the Indian dhoob grass, *Cynodon dactylon*, sometimes called Uganda grass, a fibrous-rooting variety that does not stand up well to drought ; and *Cynodon transvaalensis*, known variously as Uganda, Masindi, or Florida grass (Florida being a suburb of Johannesburg). This is a tufty grass and even finer than the dhoob, and has the disadvantage of requiring much care in cutting and rolling if an even lawn is to be maintained and cushioning is to be avoided ; it dies off rather readily in a drought.

Planting. This should be taken in hand as soon as the rains have set in properly and the ground has had a good soaking. Kikuyu grass is common everywhere and available in all districts to furnish a supply of cuttings for planting up the lawn. The best pieces to use are the young growing tips of strong surface runners, cut off about 6 inches long ; older pieces are less good as they make growth much more slowly. The cut ends of these tips should be buried 3 or 4 inches deep, the soil being pressed in and levelled with the hand as planting proceeds. The closer the planting the sooner will the lawn become an accomplished fact ; for all practical purposes 6 by 6 inches is satisfactory and quick. A good soaking as soon as possible after planting will settle the soil round the roots and ensure a good plant ; and, failing rainfall, watering by hand for at least a week after planting will be a great help.

Should dhoob or Masindi grass be chosen, small runners in the former case and small tufts in the latter should be planted. They must be procured from another lawn already established elsewhere, and will there be found in quantity.

Maintenance. As soon as the lawn is seen to be established it should be lightly rolled, choosing a day when the soil is dry enough not to stick to the roller. Frequent rollings are indicated, the later ones with a heavier roller. As soon as the ground is covered with grass the mowing machine should be brought into use. With lawns of Kikuyu grass frequent mowings and rollings are essential if the strong growth of the grass is to be kept in check.

Early weeding after planting is a most important factor in the production of good lawns. Weeds should be taken out bodily while they are small and as they appear, and too much time cannot be given to this important work. Equally great care should be taken to eliminate all other indigenous grasses as soon as they can be recognised; if left they are likely to take charge of the lawn and ruin it entirely.

Renovation. To renovate an old Kikuyu grass lawn that has been neglected, all weeds and rogue grasses must first be taken out with all their roots and runners. Next the remaining grass must be chopped off with a panga right down to ground level, leaving nothing but the roots. The surface is to be levelled up with any good and seed-free soil available, and thoroughly rolled. When rain comes a lawn so treated will recover as by magic, and subsequently rolling and mowing must be done as required.

If at any later date a top-dressing of manure or forest soil is applied, care should be taken to ensure that this is free from seeds and weeds of all sorts. To obtain this freedom the dressing should be heaped, watered, and turned for several weeks before it is applied, in order that any seeds it may contain may declare themselves by germination and be discarded.

HEDGES

Hedges may be of different types, and the species of plant to be used depends on the kind of hedge required. There are (A) the barrier or boundary hedge ; (B) the screen or rough flowering hedge ; (C) the formal clipped hedge ; and (D) borders or edgings.

(A) BOUNDARIES OR BARRIERS

Impenetrability is the chief desideratum, and therefore species with thorns are most desirable. The most useful are:

Bougainvillea *spp.* If plenty of space is available, these shrubs, planted, say, 6 feet apart, can soon be intertwined into an impenetrable and very handsome hedge. Cuttings.

Kei Apple (*Aberia caffra*). Plant double row, 9 inches between rows, 2 feet apart in each row and alternating with the plants in the other row. Should be kept roughly topped at any height from 4 to 8 feet, or may be formally clipped. Rather slow, 3 to 5 years, to make a hedge, but very hardy in dry or moist districts from 4,000 to 8,000 ft. Propagated by seed (see page 232).

Lycium horridum. See page 108.

Madras Thorn (*Pithecellobium dulce*). Suited to the Coast and low elevations. Seeds.

Mysore Thorn (*Caesalpinia sepiaria*). Quick growing, straggling, very thorny shrub. Makes a broad dense mass that is difficult to keep into a neat hedge, but is quite impenetrable. Best sown direct *in situ*, 1 foot apart.

Spiny succulents. Plants like Sisal, American Aloe, Mauritius Hemp, Prickly Pear, and Climbing Cactus (*Pereskia*), take up a lot of room but make impenetrable barriers, and are especially useful in dry districts. Seeds or suckers ; plant 3 feet apart.

(B) SCREENS, WINDBREAKS, FLOWERING HEDGES

Many trees or shrubs can be planted close to make a screen, but they all take some time to grow. Frequently a screen is required in the shortest possible time, and in that case it is best to put up a rough framework and plant climbers such as Morning Glory, Nasturtiums, Granadillas, etc. A more permanent shrub hedge can be planted in front if desired, eventually to take the place of the partly artificial screen. For this purpose some of the following are suitable :

Cupressus spp. Above say 5,500 ft., Cypresses are fairly fast growing, will grow to any desired height, and can then be kept topped. Plant 1 to 2, 3, or 4 feet apart. In dry districts *C. arizonica* and *C. glabra* are the best species. In medium districts *C. lusitanica* or *C. Benthami*, and in moister districts *C. macrocarpa* do best.

In coastal or warmer up-country districts shrubs, such as Pomegranate (cuttings), *Duranta* (seeds), *Caesalpinia pulcherrima* or 'Barbados Pride' (seeds and suckers), Scarlet Hibiscus (cuttings), Variegated Crotons (cuttings), *Bambusa Fortunei* or Hedge Bamboo (division), make very ornamental rough hedges or screens. Most of these, but not the Crotons, will do well up to 6,000 ft.

For hedges that will not only form a boundary or screen, but also at the same time give a good show of flower, the best are : (*a*) For the Coast or warm medium altitudes : Scarlet Hibiscus, Pomegranate, *Lantana*, *Bougainvillea*. (*b*) For medium and higher elevations : *Lantana*, *Plumbago*, *Tecoma capensis*, Pink Cluster Rose ; the two latter require some support, at any rate to start with.

(C) FORMAL CLIPPED HEDGES

For hedges that will stand constant close clipping and keep a dense foliage down to the ground the choice is rather limited. The following make excellent hedges at medium or higher altitudes :

Aberia caffra. Kei Apple. A good dark green foliage. Very hardy and adaptable. Will grow on black soil or red, and at nearly all altitudes, but is specially suited to dry districts. Rather slow. Seeds. See above.

Carissa grandiflora. 'Amatungula,' or 'Natal Plum.' Very similar to Kei Apple. Seeds.

Cupressus macrocarpa. Perhaps the finest of all clipped hedges, but only really suited to districts above 6,000 ft. with a rainfall of not less than 40 inches. Can be grown to and kept clipped at any height desired, from 4 or 5 feet to 12 or 15 feet, like a Yew hedge. Fast growing; will make a fine hedge in three years. Seeds; 1 to 2 feet apart.

Cupressus arizonica. Similar type of hedge to *C. macrocarpa*, but hardier to drought and can be grown in warmer drier districts down to 5,000 ft. Not such a good colour or quite such a close, even foliage as *C. macrocarpa.* Seeds.

Duranta repens. A fine hedge of a beautiful fresh green colour. Suited to low and medium altitudes. Will stand a fair amount of drought. Seeds or suckers. In a hedge for clipping the seedlings are probably best planted 18 inches apart in a single row. It is very important that any gaps due to deaths should be replanted so that the row is quite complete. The plants may be lightly topped and side-trimmed when about 2 feet high, and allowed to get a little higher and broader at each clipping. On no account should the top be allowed to become broader than the bottom; in fact, every effort should be made to keep it slightly narrower.

(D) EDGINGS FOR BORDERS OR PATHS

The best edging is undoubtedly Christ's Thorn (*Euphorbia splendens*). This must be kept narrow and low by frequent clippings, as if it be allowed to grow strongly the roots tend to spread and impoverish the adjoining beds. If kept in control it is probably the best substitute for Box that can be grown in Kenya at low and medium altitudes. Possibly Box (*Buxus sempervirens*) itself may succeed at higher altitudes.

Another good edging for warm districts is 'Babu's Delight' (*Alternanthera* sp.). Small succulents like *Stapelia* or *Huernia* species can be used, and also, of course, many types of ordinary flowers, especially bulbous plants. See also *Sida*, page 114.

Preparation of the Ground. Before planting a hedge a strip of ground not less than 4 feet wide must be cleared of all vegetation, and broken up fine to the depth of at least a foot in order that all roots may be removed. This can be planted direct; but the hedge will do better if the centre of the cleared strip is trenched 1½ feet wide by 2 feet deep, the soil being well broken up and enriched with manure before it is returned for the planting. The planting should be undertaken at the beginning of the rains.

Maintenance. It is essential that a strip of ground 2 feet wide (or more in the case of a tall hedge) should be kept constantly clear of weeds, grass, and grass roots on each side of a hedge. A hedge that has to compete for its food and moisture with invading grass roots, or with the roots of trees or shrubs growing too close to it, cannot be expected to do well and will be prone to die off in a drought.

ORNAMENTAL FOLIAGE TREES AND SHRUBS

In Great Britain a striking feature of many large gardens and parks is the wonderful variety of non-flowering trees grown for their handsome form or foliage and planted as avenues, clumps or single trees. They have been assiduously collected from many parts of the world, and the great majority are conifers, such as Cypresses, Thujas, Cedars, *Araucaria*, *Cryptomeria* and others, though there are also many fine broad-leaved trees, such as the Beech, Oak, *Ailanthus*, and so on.

In Kenya also we can grow a good selection of similar types, but of species differing from those of Home gardens, and with a bigger proportion of broad-leaved kinds. At high elevations some of the species successful in England, such as Oaks, Lawson's Cypress, *Ginkgo*, and *Cryptomeria*, can undoubtedly be grown; but the seasons are not really suited to them, and it is doubtful if they are worth persevering with except for purely sentimental reasons.

There are many handsome indigenous foliage trees, such as *Podocarpus*, *Croton*, *Trichilia*, *Ficus* (Wild Fig), Olive, Mango, Tamarind, *Entada*, and *Acacia*, and these will be found mentioned in the chapter on Indigenous Plants. The following list contains some of the commoner exotic foliage trees which have been found successful and suited to various purposes and conditions. There are still many others to be tested which may prove valuable in certain districts, and for some districts the most suitable tree has probably not yet been found. It must be particularly borne in mind that foliage trees, whether in avenues or as single trees, should be given ample room to display themselves. Where a clear bole surmounted by a good crown is wanted, the trees can be planted close or with other trees, and thinned out after 5 or 10 years to allow the crown to develop; but where foliage right to the ground is desired the tree must have ample space throughout its life. Trees of narrow form may be planted as close as 20 feet; but trees such as the larger Cypresses will eventually have a spread of at least 50 feet, and so must be planted at least 50 feet apart and 25 feet back from a road or path. While small they may be interplanted with shrubs or other trees, but special care must be taken that these are removed in time and never allowed to interfere with the principal species. An adequate area of the soil round the stem of a specimen tree or shrub must always be kept bare and free from weeds, grass, and invading grass-roots. See page 181.

All the trees mentioned below, with the exception of *Araucaria excelsa*, can be studied in the Nairobi Arboretum, but it must be remembered that many will develop an even better appearance in other districts and under more suitable conditions. All are propagated by seed.

Acacia melanoxylon. Australian Blackwood. Tall, upright, narrow crowned tree, only suited to cooler, moister districts, say above 7,000 ft., and with 45 inches rainfall.

Acrocarpus fraxinifolius. Shingle Tree. Tall, clean-stemmed, medium-crowned, quick-growing tree, with handsome pinnate leaves and brightened by red-tinted young foliage at most seasons of the year. Low and medium altitudes with good rainfall, but will successfully stand periods of drought.

Araucaria Bidwillii. Bunya-bunya Pine, Monkey Puzzle. Tall, dark green, compact, cone-shaped tree, with dense branch growth and closely set foliage right to the ground. Low and medium altitudes with a good rainfall.

A. brasiliana. Brazil Pine. Very similar to the Monkey Puzzle (*A. imbricata*) of Home gardens, but handsomer, with lighter green and finer foliage. All altitudes from 5,000 to 8,000 ft., but only moderately drought-resistant.

A. Cookii. Cook's Araucaria. A beautiful tree with a very formal Noah's Ark Tree shape. Soft non-spiny foliage of a lovely shade of green, and branching right to the ground. Medium altitudes with medium rainfall, but may grow outside these limits.

A. excelsa. Norfolk Island Pine. A tall tree of very formal conical shape, rather similar to *A. Cookii*, but with branches slenderer and much more widely spaced. Not so successful in Kenya as *A. Cookii*, but a few have grown into big trees in Nairobi, and it may be more certain at rather higher altitudes.

Artocarpus integrifolius. Jack Fruit. In Kenya a small compact bushy tree with large glossy dark green leaves. Suited to the Coast and lower altitudes, but will grow up to 6,000 ft. in sheltered situations with a fair rainfall.

Callitris robusta. Cypress Pine. A small upright growing Cypress-like tree with handsome bluish-green foliage. Will grow in hot dry sites on poor rocky or sandy soil, and may therefore be used for small avenues or groups where the Cypress will not grow.

Casuarina *spp.* Disliked by many people but admired by others, and mentioned here because some species, notably *C. equisetifolia*, will grow on sand or coral at the Coast where little else will succeed. Other species such as *C. Cunninghamii* and *C. torulosa* are better suited to up-country conditions, and make quite handsome trees.

Cedrela Toona. Toon Tree. A handsome tree with a large spreading crown, and long graceful pinnate light green leaves. Low and medium altitudes up to 6,000 ft., and probably higher if sheltered. Prefers a good rainfall but will stand considerable drought.

Cupressus arizonica. Arizona Cypress. Bushy, compact, medium-sized tree with light or bluish-green foliage. Fairly hardy to drought and suited to warm, moderately dry situations, possibly down to 4,000 ft. *C. glabra* is a variety of *C. arizonica* of similar form, and grows well in similar situations in Kenya.

C. funebris. Chinese Weeping Cypress. A very round bushy tree with dense, gracefully pendulous foliage. Does well with medium altitude and rainfall, but will probably grow anywhere from 5,000 to 8,000 ft.

C. lusitanica. Mexican Cypress. A tall graceful tree with light green or glaucous foliage, but very variable in colour and growth form. Fast growing. Suited to all districts above 5,000 ft. with good soil and fair rainfall. Only very moderately drought-resistant. *C. Benthami* (Bentham's Cypress), a variety of *C. lusitanica*, is faster growing but usually not so straight and very liable to windfall.

C. macrocarpa. Macrocarpa or Monterey Cypress. A large tree with stiff rather ascending branches and dark green foliage. A very handsome tree, which should only be grown on deep soil with at least a 40-inch rainfall. Fast growing.

C. sempervirens var. *pyramidalis.* Italian Cypress. The well-known tree with the remarkable narrow upright form. Very picturesque in suitable settings. Does well in warm dry districts from 5,000 to 7,000 ft., but also at higher altitudes. Seed does not breed true, and only a proportion of the seedlings will have the true narrow form of which one cannot be sure until the trees are about 2 ft. high.

C. torulosa. Himalayan Cypress. A very tall handsome tree, particularly the variety *majestica* grown in

Nairobi. This is pyramidal in form, with branches right to the ground and graceful pendulous foliage. Moderately drought-resistant and suited to districts from 5,500 to 7,500 ft. with not too heavy a rainfall.

Eriobotrya japonica. The Loquat. A small compact tree up to 25 feet, with dense foliage of large leaves and branches to within 2 or 3 feet of the ground. Usually grown for its fruit, but handsome and useful where a small foliage tree is required. Very adaptable, and will grow in most districts from 5,000 to 8,000 ft. with moderate to heavy rainfall.

Eucalyptus citriodora. Lemon-scented Gum. A very tall clean-stemmed tree with comparatively small crown. Leaves deliciously scented, very noticeably so after rain, and the smooth-barked bole is distinctly handsome. Will grow in most sites from the Coast to 7,500 ft. Will stand much drought and will also do well on black cotton soil.

E. rostrata. Red Gum. Included here because though not particularly handsome, it will grow into a very large and noble tree on poor dry soils or black cotton soil where little else will do so well. Rather unsightly in its early life, but in twenty years or less it becomes a tree very well worth having in such situations.

E. saligna. Rose Gum, Saligna Gum. From the foliage point of view the handsomest of all Eucalyptus. A very fast growing, very tall tree, with a striking whitish-green bole and a large crown of dense dark green foliage. Will grow in all districts from 4,000 to 8,000 ft., but for permanency requires deep moist soil or a rainfall of over 40 inches.

Ficus elastica. India-rubber Tree. A large spreading, quick-growing tree with large, leathery, shining leaves. Low to medium altitudes with fair rainfall. Many other exotic species of Ficus make fine shade trees, but are not superior in this respect to the local species which are mentioned in the chapter on Indigenous Plants.

Grevillea robusta. Silky Oak. A medium-sized tree with pretty fern-like leaves. Very adaptable, 4,000 to

7,500 ft. Will stand drought and grow on rocky sites, but thrives and is at its best as a foliage tree on good soil with a fair rainfall.

Machaerium Tipu. A beautiful tree, large, with a spreading, rather flat crown of light, small-leaved foliage. Rather straggling and ungainly in form during its early youth, but it soon grows out of this and can also be helped by staking. Appears to grow well in good soil in all districts from 5,000 to 7,500 ft., and may do outside these limits.

Palms. Palms are suited to the warmer and wetter parts of the country. Probably none are worth growing above 6,000 ft. ; up to this altitude with a fair rainfall the Canary Palm, *Phoenix canariensis*, makes a handsome tree, as also does *Seaforthia elegans*. The indigenous Mukindu Palm will grow as an ornamental shrub up to 7,000 ft., but will only develop into a tree in warmer districts below 6,000 ft. with a heavy rainfall. At the Coast and in the wetter districts below 5,000 ft. many kinds of Palms will grow.

Pines. Mentioned here as some people admire them and others like to grow them for sentimental reasons. The most picturesque member of the family, the Scots Pine, will not grow in Kenya nor will any of the more northern species. The most successful are *Pinus radiata* (Insignis Pine), *P. canariensis* (Canary Pine), and *P. halepensis* (Aleppo Pine), the first being the strongest grower. They will grow in most districts from 6,000 ft. upwards, but on the whole they are rather uncertain in both growth and length of life. *P. radiata* requires good deep soil, while *P. halepensis* will grow in drier, poorer sites. It is very necessary to inoculate the soil in which they are planted with soil from under other Pines which are doing well.

Pithecellobium Saman. Rain Tree. A large quick-growing tree with a big spreading crown. Only suited to the Coast and altitudes up to 4,000 ft. with a good rainfall.

Schinus molle. Pepper Tree. A short-boled tree with a compact rounded crown and graceful light green foliage.

The most generally useful of all foliage trees for Kenya. Very tolerant of all conditions of soil from rocks to black clay, and of climates except the coldest and wettest.

Schizolobium excelsum. One of the finest of flowering trees, but also striking as a foliage tree. A tall, slender, green-stemmed tree with spreading branches and very long graceful bipinnate leaves. Low and medium altitudes with good rainfall, but does fairly well up to 6,000 ft. and stands some drought.

Tristania conferta. Brush Box. A tall handsome tree with narrow crown and smooth shiny leaves. Useful from its compact form and tidy appearance. Likes good soil and a fair rainfall, from 5,000 to 7,000 ft.

ORNAMENTAL FOLIAGE SHRUBS

Many shrubs and plants grown for their foliage will be found described in other chapters of this book, and include the following: *Acalypha*, *Agave*, *Arundo donax*, *Dracaena*, *Furcraea*, *Leucadendron*, *Melianthus*, *Nandina*, *Phormium*, *Phyllanthus*, *Sansevieria*, and *Yucca*. A few others worthy of notice are described below.

Bamboos (*Bambusa*). The following exotic Bamboos do well from the Coast up to 6,500 ft. with a good rainfall :—

B. Balcoa, tall and green-stemmed.

B. Fortunei var. *variegata* (page 179), dwarf, with variegated ornamental foliage. Does well in Nairobi, and probably also in most districts with a fair rainfall.

B. nutans, of medium size and green-stemmed.

B. vulgaris var. *variegata*, with green and yellow stems.

Gigantochloa ater, tall and black-stemmed.

Phyllostachys nigra, dwarf and black-stemmed.

None of these is likely to do well above 6,500 ft. But no doubt other species could be found that would grow above that height. The Bamboo of the Kenya Bamboo forests, between 7,500 and 11,000 ft., is *Arundinaria alpina*.

When planting Bamboos it must be remembered that as a class they run and sucker freely, are bad neighbours, demand a lot of space, and are not suited to small gardens. Propagated by division and suckers.

Cordyline *spp*. Club Palms. Allied to *Dracaena*; graceful palm-like plants up to 12 feet in height, many having leaves that are striped, spotted, or variegated with colours such as yellow, pink, red, or brown. Cuttings or suckers.

Crotons (*Codiaeum*). Handsome shrubs up to 7 feet in height, with variegated and often brightly coloured leaves variously shaped. A feature of the gardens at the Coast, and suitable to the lower altitudes only. Cuttings.

CHAPTER XIV

VEGETABLES

Introduction—Site—General Cultivation—Rotation of Vegetable Crops—Equipment—Watering—Succession of Crops—Mulching—General Hints—Alphabetical List of Vegetables—Salads—Herbs—Some Useful Tables.

THE keynote of successful vegetable growing in Kenya sounds in one main axiom: 'Grow on the crop without check from seed to maturity.' All local variations in practice—times of sowing, manures used, methods of watering, shelter afforded, etc.—hinge upon and revolve around this principle. Owing to the tremendous variations in altitude, seasons, and climatic conditions, it is impossible to draw up any 'time-table' or programme of work applicable to the whole country, but, if (i) the above axiom be constantly borne in mind, (ii) common sense be brought to bear on every problem as it arises, (iii) due regard be paid to the requirements of individual crops, it will be found that vegetables of every kind, and of really high quality, can be grown in practically every settled area in Kenya.

Experiments should also be continually carried on as to the variety of each vegetable most suited to any particular garden. It is astonishing to find how successful a gardener can be with, say, one particular variety of cauliflower, after repeated failures with many other varieties, even when such varieties may flourish in other gardens near at hand.

Naturally crops *can* be produced with a tithe of the trouble outlined in this chapter, but the writer has assumed that the reader will want to be, as far as possible, *assured* of high quality culinary crops throughout the year. With a permanent staff of one native garden boy, supplemented seasonally for ' rush ' jobs, such as weeding, and ' heavy ' jobs such as trenching, the average household should obtain a continuous supply of healthy and excellent home-grown vegetable food. It must always be remembered that if the kitchen garden is to pull its full weight in the economics of the household, careful work in the garden must be extended into the kitchen, and due attention paid to the correct time and method of gathering the vegetables, besides the actual cooking and serving.

SITE

The site of the vegetable plot should be carefully chosen with regard to soil fertility, shelter from wind and afternoon sun, and access to water. Wind has an even more desiccating effect on plant life than sun, but shelter can be artificially supplied by either high fencing, tree planting, or both. If planting be adopted, choose trees or shrubs which do not make an undue demand on soil moisture, and plant all trees at least 20 feet away from the vegetable lines. Most indigenous trees and all gums are thirsty subjects. Loquat trees are good for shelter and shade, and Yellow Broom for a wind-break. Fencing, of whatever height, must be thoroughly buck and child proof. Shelter from sun is best provided by movable shades directly over the beds, made of Kavirondo matting, split bamboos, American cloth, or Hessian; grass shades quickly deteriorate, and bring the seeds of weeds into the garden. Slopes are to be avoided as they are liable to heavy ' wash ' in the rains.

GENERAL CULTIVATION

Owing to the natural high fertility of most soils in the residential areas of the Colony, heavy dressings of artificial manures should not be necessary: rather the gardener's aim should be to bring the soil to that state in which the maximum of moisture can be best retained, and the plant food in the soil be made most available. To that end, thorough *previous* cultivation with green manuring and the addition of well-rotted farm manure, and leaf-mould from the compost heap, should form the basis of operations. In this chapter, the term ‘ manure ’ means farm-yard manure, green manure and compost, the term ‘ fertiliser ’ being used when artificial manure is needed for some special supplementary purpose. When the garden is not attached to a mixed farm, or farm-yard manure not available, substitute green manure and compost. Usually goats’ manure from huts, or cattle manure from native ‘ bomas ’ can be cheaply bought in sufficient quantity to bring a small garden to a high state of fertility. Poultry manure, wood-ash, refuse, etc., should be incorporated in the compost heap.

Rotation of crops should be practised, as, although all crops require very much the same plant foods, different crops require them in different proportions, and search for them at different depths, so that the grower must take advantage of individual plant characteristics and requirements in order to maintain the fertility of the garden at the minimum of expense. A really satisfactory rotation can only be arrived at by experience; kinds of vegetables botanically related (such as turnip and cabbage, potatoes and tomatoes) are often subject to the same diseases, although they do not seem alike, so that they cannot ‘ clean ’ land for each other. To put the matter very briefly—short season crops should precede long season crops, shallow rooters deep rooters, and residue-producing crops (which are largely turned under) heavy feeders. Crops requiring chiefly phosphates and potash are: potatoes, beans, peas; requiring chiefly nitrogen and phosphates: cabbage, cauliflower, sprouts, broccoli; chiefly nitrogen and potash: beet, carrot, parsnip, radish, rhubarb; requiring all three more or less equally: onions, leeks, turnips, celery.

A rough guide to vegetable crop rotation is shown on the next page.

PLAN FOR VEGETABLE PLOT TO SECURE CORRECT ROTATION

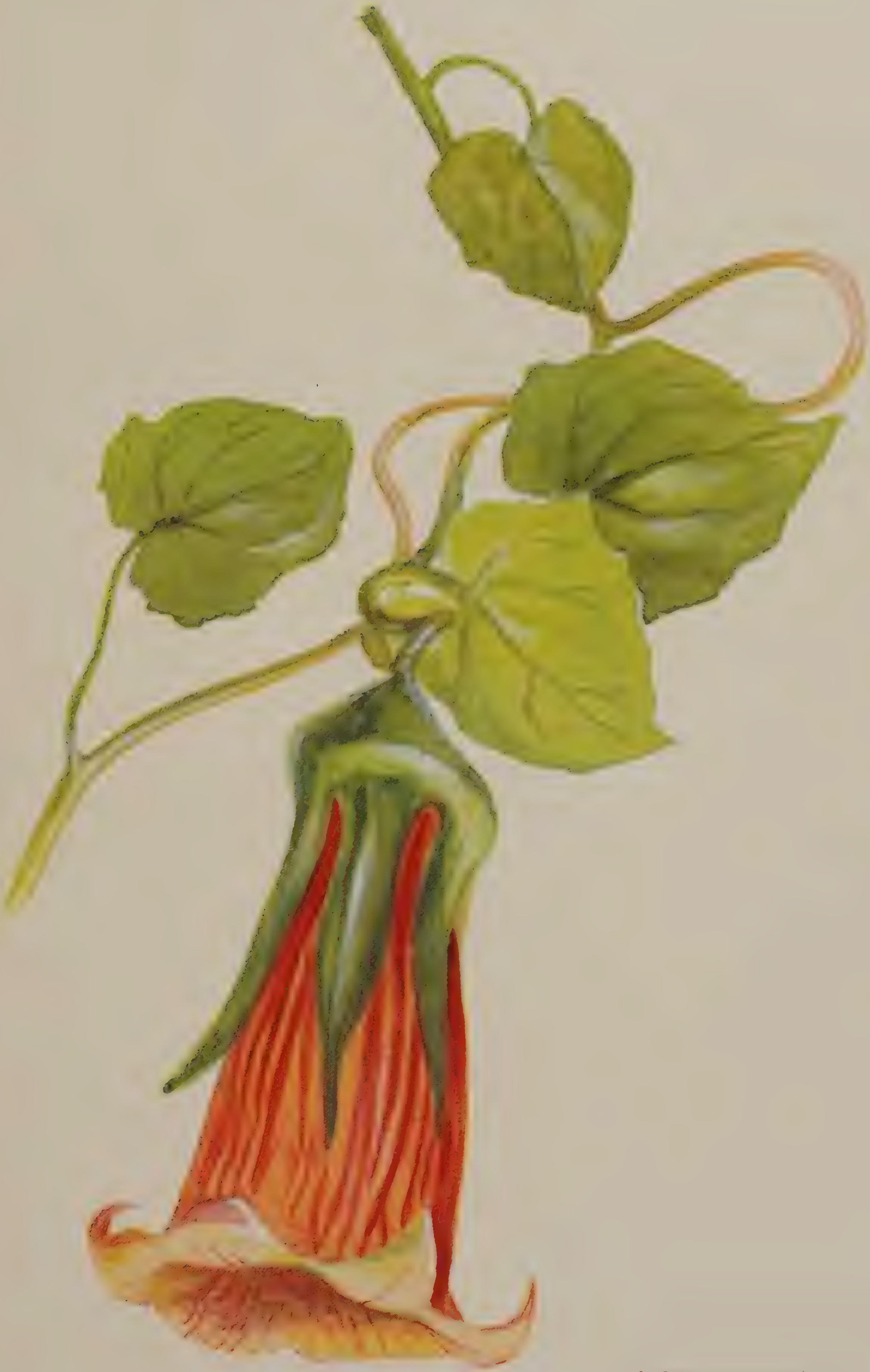
	First Year.	*Second Year.*	*Third Year.*
Section I	Bean (broad)	Bean (runner)	Cucumber
	Bean (dwarf)	Broccoli	Marrow
	Beet	Brussels Sprouts	Potato
	Carrot	Cabbage	Tomato
	Celery	Cauliflower	
	Leek	Kale	
	Lettuce	Pea	
	Onion	Spinach	
	Parsnip	Turnip	
	Radish		

	First Year.	*Second Year.*	*Third Year.*
Section II	Cucumber	Bean (broad)	Bean (runner)
	Marrow	Bean (dwarf)	Broccoli
	Potato	Beet	Brussels Sprouts
	Tomato	Carrot	Cabbage
		Celery	Cauliflower
		Leek	Kale
		Lettuce	Pea
		Onion	Spinach
		Parsnip	Turnip
		Radish	

	First Year.	*Second Year.*	*Third Year.*
Section III	Bean (runner)	Cucumber	Bean (broad)
	Broccoli	Marrow	Bean (dwarf)
	Brussels Sprouts	Potato	Beet
	Cabbage	Tomato	Carrot
	Cauliflower		Celery
	Kale		Leek
	Pea		Lettuce
	Spinach		Onion
	Turnip		Parsnip
			Radish

Permanent beds: Lima Beans, Horseradish, Parsley, Rhubarb.

PLATE V.



John Bale Sons & Danielsson, L^td London

CANARINA ABYSSINICA

See page 167.

The objects of the two different forms of cultivation—deep and shallow—must be borne in mind. Deep digging is essential before the ground is cropped to ensure a correct texture of soil, thus making the plant food available and retaining moisture. Shallow hoeing must be carried out throughout the growing period at every available opportunity, to kill weeds and check evaporation from the surface soil.

In England, a plot 30 feet × 90 feet 9 inches (*i.e.* 10 square rods, or 302½ square yards, or one-sixteenth of an acre) is capable of supplying vegetables throughout the year for four people. Although such intensive cropping is not advisable in Kenya, it is far better to concentrate on the thorough cultivation of a small plot than to depend on a larger area of semi-worked ground. Suppose, then, that a quarter of an acre is the ‘ economy unit ’ for a family of three or four.

If this quarter-acre garden is connected with a mixed farm, the following preparation can be looked upon as ideal—

(1) A shallow first ploughing ; all tussocks and grass should be lifted and thrown into the compost pit.

(2) Apply not less than ¼ ton of agricultural lime.

(3) Two harrowings—disc and tooth.

(4) After, say, a month's interval, a deep cross ploughing (*e.g.* as deep as can be ploughed without bringing up any subsoil) and two or three harrowings.

(5) In the next rains a heavy planting (say 20 lb. to the ¼ acre) of beans or peas, and application at sowing of 25 lb. superphosphate.

(6) Dig in this green crop in the flowering stage in the following manner : mark out the plot in lines 2 feet wide and 3 feet apart. Take out the soil in the 2 feet lines to a depth of 18 inches and lay aside. Fork the resulting trenches to another 18 inches depth. Lay any cattle or goat manure available on the bottom of the trenches up to a depth of 1 foot. Pull the green crop in adjoining 3 feet space and lay along the top of manure layer. Fill in the

trench with its own top soil, and repeat the process for all lines. The 2 feet lines should be marked and kept weeded until the next rains, when they should be heavily top-dressed with compost, forked over, and reduced to a fine tilth. Cropping may safely be started on the appearance of the first rain. Such land should answer the description ‘heavily manured for a previous crop,’ or ‘deep rich soil,’ and with deep forkings between crops should last for many seasons. Subsequent applications of manure or fertiliser are dealt with below under the individual crops.

In gardens where the above procedure is impossible owing to lack of implements or of time, hand-digging of the whole plot must be resorted to, either by ‘trenching’ or ‘bastard’ trenching. If the former cannot be done all at once, prepare sufficient space for the deeper-rooted crops by trenching and plant the remainder on bastard-trenched ground, until such time as the more thorough cultivation can be given.

‘Trenching’ is done in lines to the depth of three ‘spits’ (*i.e.* 3 feet) ; dig a trench 18 inches wide to the depth of two spits. Remove this soil and lay it at the farthest end of the block where the last trench will be. Then loosen well the next or third spit of soil in the first trench, but do not remove it. Take another line of 18 inches adjoining the first trench, and tumble the two top spits into the first trench. Loosen the third spit of soil in the second trench. Repeat until the end of the block, and fill in the last trench with the soil from the two top spits of the first trench.

‘Bastard trenching’ consists of digging the first spit in every trench to a good state of pulverisation and then loosening the next 6 inches of soil below. Whenever possible, a quick leguminous green manure crop should be sown with an application at time of sowing of superphosphate (at the rate of 100 lb. to the acre), and dug in at least a month before cropping, and a top dressing of compost given just before cropping.

Since the first days of land preparation the ‘compost heap’ should have been taken in hand. In the corner of the plot, or directly accessible to it, dig a pit about 10 feet square and 4 feet deep. Into it throw all available green matter, refuse, etc.; every week take half a bucket-full of *raw* cattle manure free from litter, and dilute it with water until it is like thin soup. Sprinkle this over the pit, thoroughly fork and turn the green matter; keep the pit always moist, and when full cover with earth and make another. In about 2 months (according to moisture content) a supply of valuable 'compost' will be available.

Where raw cattle manure is unobtainable, a formula for making compost with 'artificials' may be obtained from the Department of Agriculture.

EQUIPMENT

A small 'Americani House' (page 39) is ideal for seed work, as nothing else provides control over growing conditions in such a convenient form.

Seed work in this house should be started towards the end of February. Collect boxes (such as kippers are imported in) from sympathetic store-keepers, and other suitable boxes, some very shallow (about 3 inches deep), will do for sowing, and others up to 8 inches for 'pricking out.' Bore several holes in the bottoms, and cover with a layer of charcoal for drainage. Use clean sand (not from the soda lakes) $\frac{1}{3}$, sieved rich soil $\frac{2}{3}$, to fill the boxes. Press the surface evenly down with a board, water, allow the inevitable crop of weeds to germinate, clean, and sow directly after.

Practically all vegetable seeds are better 'pricked out' (*i.e.* transplanted to deeper boxes prepared in the same way) about 2 inches apart. Discard all weakly, misshapen or damaged seedlings most rigorously. The pricking out should be done when the seedlings are big enough to handle and have formed about four true leaves, and the final planting out should never be done till the plants are really big and strong. Avoid sowing too thickly; always harden off the plants in boxes by exposure to sun and night air before planting out. During this process beware of small birds ; it may be necessary to cover the boxes with wire netting.

A strong steel fork, spade, shovel, *panga*, Dutch hoe, *jembi*, *Kerai* (for carrying compost, etc.), garden twine, rake, watering can, barrels for water storage and liquid manure, dibber, pruning knife, trowel, hand fork, will all be required. A roller may be borrowed from the lawn occasionally, and a ‘ Planet Junior ’ for hoeing is a great convenience. Have a good supply of labels, and *garden* (not the usual indelible) pencil. On the plot itself have in readiness a supply of bracken, ‘ lelechwa,” or other leaves for shading the young plants directly they go out. An initial check of even a few hours strong sunlight or wind is very bad. Choose cool showery days and afternoon hours, when possible, for planting out.

WATERING

The native gardener is, as a rule, an unskilled waterer, and constant supervision should be given to this most important operation ; on all occasions give plants a *thorough* watering, even if individual rows can only get it once a week. Nothing is worse practice than a daily dribble. Water preferably from 4 P.M. onwards, or, if in the morning, never after 8 A.M. ; for seed work water warmed in the sun all day is the best, thus avoiding a sharp change in temperature for the seedlings.

SUCCESSION OF CROPS

The most difficult part of vegetable gardening lies in obtaining a succession of crops. No form of watering—apart from skilled irrigation—has quite the same effect on crops as favourable climatic conditions. Especially in the early part of the big rains do we encounter hot, dry spells interlarded with violent rain storms. Protection to the seedling or transplant from sun, wind and wash is necessary early in the season. Certain crops may, however, be sown at intervals in the open ground, and a succession at any rate partially thus secured. Plants grown *in situ* have a lesser tendency to ‘ bolt ’ than transplants, so that earlier heads can be obtained from thinnings—an extra transplanting will provide a check.

Crops can be hurried on by the application of a quick-acting fertiliser, such as sulphate of ammonia in liquid form, given at the right time. Generally speaking, stimulants should be applied at the stage when the plant is called upon to bear the biggest load, *i.e.* reproduction of its kind. If given too soon, the result may merely be excess of leaf growth. A cauliflower, for example, should be ‘ fed ’ when the small button is actually formed, an onion in the bulb stage, or the latter may, in the gardener’s language ‘ go to leeks.’ A useful dose is 1 teaspoonful of sulphate of ammonia to 1 gallon of water, applied liberally after the ground has been thoroughly soaked with plain water. Do not let the fertilizer fall on the leaves.

At all times the programme of supplies must be carefully worked out beforehand, so that the longest standing vegetables are available after the true growing season (*i.e.* the rains) is over.

MULCHING

Mulching is a valuable garden operation, designed to prolong the growing season of the plant through conservation of soil moisture. A covering of short litter, straw, grass, or bracken is strewn over the bed between and around the plants. A thin layer of lime should be first applied to check insect pests, which the mulch is apt to encourage. Well-decomposed manure is also beneficial, which can be gradually hoed in during the hot weather, thus serving the double purpose of ‘ mulch ’ in the hot weather and food supply in the rains.

GENERAL HINTS

(1) If vegetable seeds are purchased, select the varieties catalogued ‘ Early ’ in preference to ‘ Main Crop ’ or ‘ Late ’

—especially the latter, which are probably frost-resistant, a quality not necessary in East Africa. If seeds are saved from the garden, choose them only from the most robust and quickly maturing plants. Dry the seeds thoroughly when gathered.

(2) Be sure that all soil in seed-boxes and seed-beds is thoroughly compact, and never loose. Achieve the happy medium in soil for sowing—not too wet, not too dry, but water copiously *after* sowing.

(3) Always press down the soil very firmly around seedlings when planting out. Make the planters use their feet freely for this purpose, also in the preparation of open seed-beds.

(4) A light covering of litter, or bracken, will assist greatly the germination of seeds sown in the open bed.

(5) Avoid all injury to roots on lifting seedlings, especially tap-roots, which must never be twisted or bent at the tip.

(6) Sow seeds deeper in sandy soils than in heavy. The correct depth is three to five times the diameter of the seeds.

(7) Keep a diary and record the behaviour of difficult varieties under your own conditions, so that the most successful way be repeated and undesirables excluded.

(8) Rigorously avoid application of too fresh manure for all root crops. Sow these in the lines that have been heavily manured for a *previous* crop (page 194).

GENERAL LIST OF VEGETABLES

Artichoke, Globe (*Cynara scolymus*). Transplant from box or seed-bed when the fourth true leaf has developed. After the first crop, divide up the best plants and replant the suckers. Destroy all plants over three years old, replenishing with new seedlings. Manure heavily throughout growth of crop. These are not easy to transplant because of the tap-root, so may be sown two or three seeds at 2½ feet intervals and thinned out to strong plants.

Artichoke, Jerusalem (*Helianthus tuberosus*). Propagated from tubers ; very liable to disappear through attacks from underground rodents. A permanent bed may be made by sinking small mesh wire-netting round the bed to a depth of 3 feet. Dig as required for table after the tops have died down, as the tubers keep better in the ground than out of it. Likely to do best at altitudes over 7,500 ft.

Asparagus (*Asparagus officinalis*). Is not an easy crop to grow as regards quality in this country. The quickest method is to obtain two- or three-year-old crowns, planting these in a heavily manured and deeply trenched bed, taking care to spread out the roots around the crowns 4 inches below the surface. Responds well to a top-dressing of ‘ complete ’ garden fertiliser when the shoots appear. Do not cut more than half of the shoots for table, leaving the others to mature, and cut them down when the berries have coloured. May also be grown from seed in boxes or beds, but must not be cut till the second year after planting out. Unless crowns can be obtained near at hand, grow from seed.

Beans, Broad (*Vicia faba*). Sow at the very beginning of the rains. Ridge slightly when 6 inches high to support the plants. Water in a dry spell to ensure quick growth, or cutworm may work great havoc. When in bloom, pinch off the top. To ensure a long season, use *all* the pods, allowing none to go to full maturity. Desucker freely.

Beans, French (*Phaseolus vulgaris*). The stringless varieties are much the best for table. Be careful to pull early.

Beans, Golden Wax Pod. A garden variety of the ordinary French Bean with long rich yellow pods, which should be cooked whole.

Beans, Haricot. A few lines of the ‘ Boston ’ variety should be planted to harvest when fully mature, as they are excellent eating at all times.

Beans, Lima. The ‘ Seven-Year Bean.’ Invaluable in every garden, as it is a perennial, and though it will die down in the hot months will quickly grow up again on the first appearance of rain. Is very rampant, and forms an excellent screen or windbreak over a trellis, except in the dry months. A few of the plants should be set aside to mature, and the beans harvested and stored to supply dry white beans in case of a shortage of ‘greens.’

Beans, Runner (*Phaseolus multiflorus*). Cultivate on stakes or trellis. The Lima Bean is really better eating than the ‘Scarlet Runner,’ but the latter has value for succession, as it takes longer to mature and comes in well after Dwarf Beans.

Beet (*Beta vulgaris*). Sow thinly in drills, and thin out to 8 inches between the plants. In sandy soils sow the long-shaped varieties, in heavy soils the round. Keep very clean, and cultivate the surface soil freely throughout growth. In lifting, be very careful not to cut the roots and always twist the leaves off, never cut them ; any cut causes the root to bleed, and spoils the colour for table. Sow in succession and be careful to lift when on the small side. The thinnings can be used to fill gaps in other rows, or as transplants.

Broccoli (*Brassica oleracea botrytis*). Identical as regards cultivation with Cauliflower (see below). Experiments must be made in every garden with several varieties of Broccoli and Cauliflower, as in some districts Cauliflower do better than Broccoli and *vice versa*. It is merely a question of getting the right variety for individual gardens.

Brussels Sprouts (*Brassica oleracea gemmifera*). Most useful, as it is the longest standing of all vegetable crops here, and with constant picking and attention can be induced to last at the higher altitudes up to a year. Cultivate as for Cabbage, but remove all lower stalks as the buds approach the picking stage. Cut the heads, do not pull them, as a second growth will be made. The secret of robust plants lies in transplanting without injury to the tap-root.

Cabbage (*Brassica oleracea*). In transplanting, reject rigorously all weakly plants, and, as in Sprouts, pay great attention to the tap-root. Choose the smaller, more delicate varieties for garden use. Little cultivation is required beyond weeding and top-soil stirring, as deep digging and manuring should have been done previous to planting out. A succession should be planted, and if one or two rows are sown direct in the drill and thinned out, it will be found that the non-transplanted heads will stand longer without 'bolting' than the transplanted ones

Savoys are a rather longer-standing variety of Cabbage. A few plants of **Red Cabbage** should be sown for pickling purposes.

Capsicum or **Chillies** (*Capsicum annuum*). Some half-dozen plants of the small variety should be grown for pickling, sauces, chutneys, etc. For this purpose the pods are best gathered green. Transplant from boxes when 6 inches high and plant out 3 feet apart.

Cardoon (*Cynara cardunculus*). A vegetable allied to the Globe Artichoke, which is deserving of wider cultivation. The inner leaf-stalks can be blanched, and stewed like Celery. The heads also supply a multitude of flowers, similar to small Globe Artichokes. Cultivation as for the latter.

Carrot (*Daucus Carota*). The Shorthorn types are best grown in shallow soils, the 'intermediate' in medium or heavy. Carrots should be grown in lines that have been heavily manured and deeply dug for a *previous* crop. Thin out gradually, and only on wet days, being very careful not to leave air spaces in the soil after removal. The young plants benefit from shading when they first appear, and a particularly fine tilth in the bed is required to ensure perfect root development. The plants should finally stand at least 6 inches apart for the smaller varieties.

Cauliflower (*Brassica oleracea cauliflora*). Give plenty of room in the seed-boxes. Transplant to beds when the plants are 6 inches high, and reject all weaklings. When the 'button' is forward, bring on rapidly by applications of sulphate of ammonia and sulphate of potash, applied with copious waterings at the rate of one teaspoonful of fertiliser per gallon of water, avoiding contact with the leaves in watering. When the heads begin to form, break the outer leaves and bend them over the flower to preserve the white colour.

Celery (*Apium graveolens*). This is successful only in the colder districts ; but even if blanched stems of high quality cannot be achieved, the plant is delicious for soups. Celery is usually grown in trenches, for convenience in 'earthing up' for blanching. But sometimes trenching may lead to continuous disappointment owing to heavy wash, and good plants may be grown at ground level if extra attention is paid to the process of earthing up. This should be carried out at frequent intervals, only in dry weather, and with the heads firmly tied to prevent earth getting in between the stalks. Celery is impatient of any check due to drought, and responds well to protection from the sun. Deep trenching and ample manure must be supplied before planting in the following manner : remove the soil to a depth of 15 inches and loosen 3 inches more ; put in 6 inches of rotten manure, cover with 3 inches of garden soil and plant on this. Subsequent high feeding as for Cauliflower should be practised ; never earth up above the crown, desucker freely, and do not lie up too tightly.

Couve Tronchuda (also known as 'Chinese Cabbage'). The most rapidly grown of all 'greens,' coming to maturity in six or eight weeks from seed. 'Bolts' very quickly, so is best grown only at the beginning of the rains, when the main crops are anxiously awaited. It has the further advantage of putting out fresh growth if demolished by the Cabbage Fly. Sow a line in the open drill, and thin to 1 foot apart. Cook like spinach.

Cucumber (*Cucumis sativus*). This requires much attention and careful cultivation. The Ridge varieties should be grown. Prepare the bed by removing top soil to the depth of 1 foot, forming a trench 4 feet wide and to length required. Fill in to ground level with thoroughly rotted manure (fresh will generate too much heat) and cover with about half the soil that was removed. Sow down the centre of the bed, laying seeds on their side edges about 1 inch deep and 1 foot apart. Keep thoroughly moist. Train up stakes, or if allowed to trail provide frames to raise the fruits free of the ground. Shade the bed, water, and spray the leaves in dry weather. Avoid excess of moisture or the plants will damp off. Mulch the bed with short straw or litter (free from seeds), applying a top-dressing of lime under the mulch to prevent insect pests. Nip off the first point to encourage branching. Never allow a fruit to mature fully or the plant will immediately cease bearing. Remove all fruits that have been attacked by 'blow-fly.' In damp weather sprinkle sulphur powder on the leaves to prevent mildew. Should be grown in the dry season, experiments made as to suitable varieties.

Egg Plant or **Brinjal** (*Solanum Melongena*). Grow only the purple varieties. Sow in boxes, and plant out 4 by 3 feet, when the plantlets are thoroughly strong. These take several months to mature, and do best in the warmer districts. Syringe frequently under the leaves for that great enemy Red Spider.

Horse Radish (*Cochlearia armoracea*). Propagated by root division. Make suitable holes for crowns in a good rich bed, and stick in the portions of roots about 1 foot apart and 6 inches deep. When well established becomes almost a weed, so that plenty of permanent space should be allowed.

Kale (*Brassica oleracea acephala*). The Curly Kale is a useful and long-standing vegetable which is best cooked as Spinach. The cultivation is as for Cabbage, and a few plants should be grown annually in every garden to ensure the supply of 'greens' in the dry months.

Kohl Rabi (*Brassica oleracea caulo-rapa*). Should be grown for its drought-resisting qualities, and eaten when the 'bulbs' are the size of smallish turnips. Sow the purple varieties in boxes ready to plant out rather late in the rains, and when the plants have four to six leaves. Do not apply manure direct to this crop.

Leek (*Allium Porrum*). Like Celery, usually grown in trenches in holes made by a crow-bar. Transplanting from boxes or seed-beds, once or even twice, helps to strengthen the plants. Earth up gradually, as with Celery, and treat as a long-standing crop.

Onion (*Allium Cepa*). Very careful preparation is needed for the permanent bed, which should be deeply dug, manured, and reduced to a specially fine tilth, and trodden firmly with feet close together. Sow in boxes or seed-beds in very firm soil, and transplant when the plants are big enough to handle. The plantlets must be very firmly pressed into the soil. Rake between the rows soon after planting. Frequent dressings of soot and wood-ash are beneficial, and the beds must be kept very clean. Egyptian seed and 'Cape Yellow' seem to give the best results in this country, where there is a distinct tendency for the bulbs to develop thick fleshy stems, which is undesirable. If required for keeping, the bulbs must be lifted in dry hot weather, left with their leaves on the ground for a couple of days, and then hung up in bunches in a well-ventilated shed for several months. Lifting slightly with a fork to loosen the roots helps to dry off bell-formed bulbs.

Parsnip (*Pastinaca sativa*). These require very deeply worked soil to ensure good specimens. Eighteen inches of fine soil are necessary, preferably in a bed that has received heavy dressings of farm manure for the previous crop. The seed is apt to give poor germination unless very fresh. Mulching and constant soil movement on the surface should be carried out.

Peas (*Pisum sativum*). 'Early' and 'Maincrop' varieties give the best results, and the dwarf varieties of these should be planted for the earliest crops. Select thoroughly good soil, with abundance of humus and manure. Grow on rapidly, applying liquid manure (after a thorough watering) when in the flowering stage. Stake thoroughly, even with the dwarf varieties. It is impossible to grow good peas in a high soil temperature, so this crop should only be attempted during the rains, unless irrigation can be supplied. Mulching will assist the later-sown crops.

Potato (*Solanum tuberosum*). For garden use a succession of small crops is advisable, as the keeping of one main crop purely for table use would entail more trouble than is necessary. A crop of 10 tons per acre may be expected under garden conditions, so requirements for the year may be estimated on this basis. The first tubers may be planted in dry weather just before the rains are expected to break, and further plantings may be made fortnightly during the rainy season. Manure heavily with farm manure before planting. Open the trenches 6 inches deep with 3 feet between rows, and drop the tubers in 1 foot apart. The best tubers for seed are those about 1½ oz. in weight. Earth up when the plants are about 9 inches high, and again at 1½ foot. Keep very clean. If manure has been applied at the rate of 8 tons to the acre, or over, no further feeding should be necessary; but if preferred fertilisers can be applied in the trenches at time of planting at the rate of: 100 lb. superphosphate, 70 lb. sulphate of ammonia, and 20 lb. sulphate of potash per acre. Spraying with Bordeaux Mixture should be done when the crop is about two months from planting, but only in dry weather. When the potatoes are lifted, be careful to avoid injury to the tubers from pangas or forks. After a few hours' drying on the ground store in sacks or crates, being careful to exclude all light, as the least 'greening' (due to the action of light) affects the flavour very adversely. Pick over after a fortnight, to remove all tubers showing signs of decay, and store again to use as required. Different varieties should be tried, as each district seems to give different results. 'Kerr's Pink' seems to be the most generally successful; 'Golden Wonder' is an excellent table potato; 'Tinwald's Perfection' of attractive appearance, 'Great Scot,' 'Abundance,' 'Incomer,' and 'Baron' are other good varieties.

Rhubarb (*Rheum* var.). This crop depends for success on deep trenching, abundance of manure, sufficient water, and a good supply of potash. Mulch the bed in hot weather. When ready, always pull and never cut the stalks. Remove any signs of flowering stems. Divide the crowns every second year. Is most quickly grown from root division, but a few seedlings grown on every year to replenish stocks, are advisable. Fairly heavy pullings in the growing season are recommended. If a potassic fertiliser be applied, sprinkle at the rate of 4 oz. per square yard, in wet weather.

Salsify (*Tragopogon porrifolius*). Cultivation as for deep-rooted carrots, but the plants take many months to mature.

Savoy. See CABBAGE.

Scorzonera (*Scorzonera hispanica*). Cultivation and culinary treatment identical with Salsify. It is a very nutritious vegetable.

Seakale (*Crambe maritima*). As its Latin name indicates, this is a seashore plant, but it can be well grown in ordinary soils. It responds well to light dressings of potassic fertiliser (2 oz. per square yard). Sow the seed in drills 1 inch deep and 2½ feet apart, and thin to 2 feet between plants. Cover with leaf-mould or litter to a depth of 9 inches and the shoots appearing through will be naturally blanched. Nip off all flowering stems, and treat the bed as permanent.

Silver Beet or **Spinach Beet.** A delicious vegetable which provides an excellent Spinach substitute in its leaves, and a Celery substitute if the thick white mid-ribs of the leaves are stewed with Celery salt. Very easily grown, the cultivation being the same as for true Spinach.

Soo Soo or **Sho Sho** (*Sechium edule*). This is a hot-district plant, taking the place of Vegetable Marrow, which it closely resembles. Obtain two or three plants, and place, at the foot of a trellis, 5 inches deep and several feet apart. They are very prolific and take up considerable space, but can be relied on to give a good supply of small ‘ marrows ’ during the hot months.

Spinach (*Spinacea oleracea*). One of the most wholesome of vegetables. It is not very long-standing, and a succession should be aimed at. In the ‘ Summer ’ varieties the whole plant should be cut at one time ; with the ‘ Winter,’ or ‘ Prickly,’ the large leaves may be taken off as required. Sow in drills 1 inch deep and 2 feet apart, and thin out to 2 feet. Beyond cleaning, and watering freely if signs of wilt appear in hot weather, no special treatment is necessary.

New Zealand Spinach (*Tetragonia expansa*). A very drought-resisting creeping plant, invaluable to fall back on in times of scarcity. Sow in drills at least 4 feet apart, very thinly, and treat as permanent. Is apt to become almost a weed in habit.

Sweet Potato (*Ipomoea Batatas*). A hot-district plant, largely cultivated by the natives, from whom young shoots from the previous year's tubers or root-cuttings can be obtained. Set the shoots in rows 6 feet apart, and ridge up, lifting as required. Very useful in stuffing. The Latin name of this plant gave origin to our term ‘ Potato.’

Tomato (*Solanum lycopersicum*). Tomatoes flourish everywhere from the highest settled areas to the Coast Belt. They do best in light soil, with addition of farm manure. Sow in boxes, and transplant when 4 to 6 inches high into rows, 1 foot apart with 3 feet between rows. Some form of support, whether stakes, trellis, or fence, must always be provided. ‘ Stop ’ (*i.e.* remove) the side shoots twice, and plant 1 foot in the rows with 14 inches between rows. Water with liquid manure twice during flowering period, and water freely in hot weather if the plant is still growing. Tomatoes revel in strong sunlight, and must on no account be shaded. Avoid planting out in excessive wet or cold. Tomatoes are best picked when they are beginning to colour, and left to finish off on a shelf under cover.

Turnip (*Brassica Rapa*). Sow direct in the ground in drills ½ inch deep and 1 foot apart, and thin freely. The turnip crop matures very rapidly during the rains, when successions should be planted fortnightly. It requires little attention, but is difficult to grow in the dry weather, as the roots will not fill under drought conditions.

Vegetable Marrow (*Cucurbita Pepo*). A greedy crop requiring plenty of rotted manure. The ‘ Bush ’ variety is best for garden work where space is a consideration, for although less prolific it should produce a sufficiency for ordinary requirements. Once established it can do with little water, but requires an ample supply during its first stages. Cut the marrows when quite small, as for ‘ one man, one marrow ’; not only is the flavour much better at this stage, but also this treatment considerably lengthens the bearing period of the plant, always provided *none* of the fruits are allowed to mature. Sow the seeds on their side edges on little hills about 4 feet apart, and mulch heavily till the shoots show through the mulch.

SALADS

The range of vegetables useful for Salads can be very much extended beyond those few usually met with, and though succession is difficult without a good water supply, the space occupied by the Salad patch need be quite small, so that enough water should be available for its modest requirements. Every garden might include the following Salad vegetables: Beet, Chicory, Chive, Corn Salad, Cucumber, Dandelion, Endive, Lettuce, Mustard and Cress, Radish, Tomatoes, and Water—or Land—Cress.

Chicory, Corn Salad, Endive. May be treated like Lettuce. Chicory leaves may be blanched by covering the plant with brown paper.

Chives are a delicate form of Spring Onion, the stem as well as the bulb being used. Cultivated by root division. A few clumps will provide a continual supply for an average household.

Dandelion. May be easily grown from seed in the open, and treated as a perennial. The leaves are eaten in salad.

Lettuce (*Lactuca sativa*). Must be very rapidly grown to ensure a firm ‘heart.’ Transplants ‘bolt’ more quickly than plants grown *in situ*, so that the early supplies should be grown on in boxes, ready to plant out the minute the rains come, and the next supplies grown rather thickly in the drills, so that the thinnings may be treated as transplants, and then it will be found that quite a good succession will result. Several varieties should be experimented with in different districts, including some of the French drought-resisting kinds. Whether to grow ‘Cos’ (the upstanding kind) or ‘Cabbage,’ is a matter of individual taste, but the latter entail less work in the garden, as they need not be tied up to form the heart. Shade throughout growth in

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the hot districts. If a hot spell is encountered, water freely and give one or two applications of liquid fertiliser (one teaspoon of sulphate of ammonia per 1 gallon of water).

Mustard and **Cress.** Can be grown altogether in boxes or in beds, provided a very fine tilth is assured. The Cress should be sown three days before the Mustard to ensure uniformity of crop.

Radish. May be grown in an open bed with fortnightly sowings, being careful to sow *very* thinly. Require a fairly high altitude to achieve correct firmness. The round varieties are more palatable than the 'French Breakfast' long variety.

Water Cress needs to be planted by clear running water, which is not always easy, owing to 'spates' during the rains; so, for most gardens, **Land Cress** provides an excellent substitute. Best cultivated from root division, and will flourish, once established, without water except under severe drought conditions.

HERBS

Fresh Herbs are a great asset to any kitchen. The most useful are: Parsley, Thyme, Mint and Sage, though the kinds grown can easily be increased up to twenty, according to taste.

Mint. Propagated by root runners, and is liable to become almost a weed.

Parsley. Sow in an open bed, 1 inch deep, thin to 1 foot apart. A bed should last two seasons before 'bolting.'

Sage. Sow in seed-box, plant out during the rains, and shade until well established. A perennial.

Thyme. A perennial, easily grown from seed in the open bed.

Balm, Borage, Fennel, Marjoram, Purslane, Rue, Savory Sorrel, Tarragon and others can all be easily grown, and utilised in the culinary 'bouquet,' or other forms of cookery.

SOME USEFUL TABLES

Vegetable.	Seed required per 100 ft. run.	Distance between rows.	Distance between plants in row.	Approximate time taken to mature above 6,000 ft.
Artichoke :				
Globe	1 oz. or 30 roots	3 ft.	2 ft.	6 months
Jerusalem	100 tubers	3 ft.	2 ft.	6 months
Asparagus	80 crowns	2 ft.	15 in.	3 months
Beans :				
Broad	2 pints	3 ft.	1 ft.	3 months
French	½ pint	3 ft.	6 in.	8–10 weeks
Lima	½ pint	3 ft.	1 ft.	10–12 weeks
Runner	1 pint	3 ft.	6 in.	3 months
Beet	1 oz.	1 ft.	8 in.	3 months
Silver or Spinach	¼ oz.	3 ft.	2 ft.	3 months
Broccoli	¼ oz.	3 ft.	3 ft.	5 months
Brussels Sprouts	¼ oz.	3 ft.	3 ft.	6 months
Cabbage	¼ oz.	3 ft.	3 ft.	3 months
Cardoon	1 oz.	3 ft.	2 ft.	6 months
Carrot	1 oz.	1½ ft.	8 in.	3–4 months
Cauliflower	¼ oz.	3 ft.	3 ft.	4–7 months
Celery	¼ oz.	3 ft.	2 ft.	6 months
Cucumber	50 seeds	See chapter	1 ft.	4 months
Egg Plant	50 seeds	4 ft.	3 ft.	4 months
Horse Radish	50 roots	1 ft.	1 ft.	2 months
Kale	¼ oz.	3 ft.	3 ft.	4 months
Leek	½ oz.	3 ft.	1 ft.	4 months
Lettuce	¼ oz.	2 ft.	1 ft.	3 months
Onion	½ oz.	1 ft.	6 in.	6 months
Parsley	½ oz.	2 ft.	1 ft.	4 months
Parsnip	½ oz.	1½ ft.	6 in.	6 months
Peas	1½ pint	3 ft.	6 in.	2–4 months
Radish	½ oz.	1 ft.	4 in.	2 weeks
Salsify	1 oz.	1½ ft.	6 in.	6 months
Seakale	½ oz.	2½ ft.	2 ft.	6 months
Spinach	¼ oz.	3 ft.	2 ft.	4 months
Tomato	50 seeds	4 ft.	3 ft.	3–4 months
Turnip	½ oz.	2 ft.	8 in.	2 months
Vegetable Marrow	50 seeds	4 ft.	4 ft.	2–3 months

N.B.—Between 5,000 and 6,000 ft. the approximate times taken to mature will be less than those given in the right-hand column above by about 1 part in 5 or 6.

The following can be sown either in boxes or the open: Globe Artichoke, Silver Beet, Broccoli, Brussels Sprouts, Cabbage, Cardoon, Cauliflower, Celery, Cucumber, Egg Plant, Kale, Leek, Lettuce, Onion, Parsley, Seakale, Spinach, Tomato, Vegetable Marrow.

The following are better sown in the open drill or bed: Jerusalem Artichoke, all Beans, Beet, Carrot, Horse Radish, Parsnip, Peas, Radish, Salsify, Turnip.

CHAPTER XV

DECIDUOUS FRUITS

General Conditions—Fruits grown in the Colony—Varieties of Fruit to Plant—Stocks—Soils and Aspects—Preparation for Planting—Planting—Treatment for First Years—Pruning—General Care—Sprays—Pests—Dormant Seasons—Picking and Packing—Grapes.

WHILE anxious to write a comprehensive chapter on Deciduous Fruits, I feel that the subject can only be lightly touched upon, and I would like to impress upon readers that this country of Kenya is so young that the work done is mostly of a pioneer and experimental nature.

As the general principles of fruit-growing are obtainable from standard works on the subject, which give detailed information on the production of each kind of fruit, the object of this chapter is to bring particulars of local importance to the attention of the potential fruit-grower in the Colony.

Who amongst our fruit-growers cannot go into his or her orchard and say: 'If I had only known this or that, five or ten years ago, I should be in a much better position to-day'? And who can say with assurance that what is planted to-day will be of commercial value in five or ten years' time? That brings us to the point where one asks a prospective fruit-grower: Do you wish to plant for your own pleasure and experience, or do you wish to make a commercial success of your orchard? The man who grows fruit for pleasure will take a gaily illustrated nurseryman's catalogue and order what strikes his fancy; the commercial grower, however, will try to make sure of a good many things before looking into a catalogue at all.

General Conditions.—For purposes of fruit-growing the Colony can be divided into areas with climates that are either Tropical, Subtropical, or Temperate, and consequently a wide range of fruits can be grown. No fixed rules can be laid down for each area, as local conditions vary so very much owing to altitude, aspect, and rainfall, and even seasons, which cause differences of as much as a month in the blossoming dates of different varieties. Some districts even have two seasons, and a consequent double blossoming within the twelve months, as is seen in the case of Apples and Pears. In others, Citrus fruits will be found to have an almost continuous crop throughout the year. Naturally, when the fruit is planted for commercial purposes, the type grown will depend not only upon climate and soil, but upon the demands of the local markets. Transport to rail is an important factor, as the cost of transport of large supplies long distances, or of small ones even small distances, is a matter of much importance in that it may make the business unremunerative. Also in this connection it cannot be over-stressed that the production of fruit for sale, on any considerable scale, is not the work for an amateur, but rather for a fully competent and experienced orchardist possessed of very considerable local knowledge and experience, and particularly so with regard to the preparation and sale of the produce.

Fruits Grown in the Colony.—The following are the chief fruits grown in the Colony, tropical, subtropical, and deciduous; the latter naturally doing best at the higher altitudes where they get a winter season in which to rest, roughly at 7,000 ft. and over, but see page 12.

Up to 5,000 ft. Avocado Pear, Date, Grape Fruit, Lemon, Lime, Mango, Orange, Pawpaw, Pineapple.

From 5,000 to 6,500 ft. Apple, Avocado Pear, Berries of certain sorts, Custard Apple, Fig, Grape, Grape Fruit, Guava, Lemon, Lime, Loquat, Orange, Pawpaw, Peach, Pear, Pineapple, Plum.

From 6,500 to 8,000 ft. Almond, Apple, Berries of most sorts, Fig, Grape, Nectarine, Peach, Pear, Plum, Quince.

From 8,000 to 9,500 ft. Almond, Apple, Berries of most sorts including the English Blackberry, Gooseberry, Raspberry and Red Currant; Cherry, Fig, Nectarine, Peach, Pear, Plum, Quince.

Varieties of Fruit to Plant.—Selection should be made as far as possible from those varieties already proved in similar districts in the Colony. No definite rules can be laid down, as local conditions make this impossible, but a short list may be useful to the prospective fruit-grower who wishes to use his own judgment in selecting varieties to suit his own local conditions.

Apples. Blenheim Orange, Bramley's Seedling, Cleopatra, Christmas, Jonathan, King of Tompkin's County, Rome Beauty, Sharp's Early, Stirling Castle, Versfeld.

Pears. Beurré Bosc, Doyenné du Comice, Jargonelle, Keiffer, La Conte, Louise Bonne, Smith's Hybrid.

Plums. Methley, October Purple, Santa Rosa, Satsuma.

Peaches. *Subtropical.* Angel, Bell's November, Waldo. A few English varieties can be grown at higher altitudes.

Stocks.—This is a factor which is probably rarely considered by the ordinary person who thinks of planting fruit, but it is of the utmost practical importance. There are very many kinds of stocks, and very little has been done in this country to prove any of them. The grafting of Apples on the various stocks, such as 'Northern Spy Seedling Apple,' 'Crab' and 'Paradise,' will show that earlier maturity and heavier cropping are obtained by a given variety on one stock in preference to another. It would be advisable to consult the local nurseryman on this subject before purchasing trees.

Soils and Aspects.—Well-drained land, preferably of sandy loam, with a sandy subsoil, is suitable for Apples. That with a murrum subsoil for Pears and Plums, and a good, deep, rich soil for Peaches. Suitable aspects for the orchard may vary in each district, probably a westerly one being best.

Preparation for Planting.—When the site of a prospective orchard has been selected, the direction of the prevailing winds should be ascertained and a windbreak of quick-growing trees planted far enough away to ensure their roots not encroaching on the orchard. The windbreak should have a good start ahead of the orchard in order that the young trees when planted may not have their tender shoots blown all in one direction, and the shaping of the tree may not be spoilt before it has begun. Next, the land must be fenced with buck-proof netting; otherwise the planter will find one morning that his orchard has been visited by some of our small night-feeding buck, and serious damage done to the young trees. The writer has known cases where young orchards have been irretrievably ruined through neglect in fencing.

The land should be ploughed several times and well worked before planting; the lay-out must also be decided upon, the square one being best, and pegs placed where the trees will come. The holes can be dug any time before the arrival of the trees. Care should be taken to ensure planting in straight lines. Opinion on suitable distances apart varies, but from 16 to 24 feet will be found advantageous according to variety.

Planting.—The only time to plant fruit-trees is when they are dormant, and if this does not coincide with the rainy season the trees must be kept well watered until it rains. Make sure that plenty of water is allowed to soak in the bottom of the holes before planting. The holes should be oblong, say, 4 by 3 feet and 1½ feet deep, the top soil being placed on the higher side in the case of sloping ground, and the filling in being all done from that side; this ensures both that the hole is filled with top soil, and that the subsoil lying on the lower side forms a small terrace for the tree to grow on. Care must be taken to avoid any exposure of the tender roots to the sun and wind, the trees being carried in a wet bag until actually planted; the roots must be carefully spread, and the soil packed firmly round them, making sure that the correct depth is kept and planting to just below the graft.

When planting an orchard of several different kinds of fruit, with a number of varieties of each, do not mix them all up, but plant each kind with their respective varieties together. This will save time and labour when picking time comes.

There are some who say that interplanting ensures better pollination; but I should be inclined to think that there are quite enough bees in this Colony for that purpose, and that interplanting is not necessary.

Treatment for First Years.—The orchard should be kept clean for the first few years, especially round the young trees themselves, care being taken not to damage the surface roots by rough cultivation close to the trees. Catch crops of various kinds may be grown between the rows, but again, care must be taken not to damage the young fruit-trees while cultivating and handling these crops. Soil-wash caused by heavy rain will also have to be studied, and ditches dug or wash stops established. Nature gives a good cover crop in this country, which grows amazingly quickly, namely, weeds.

Pruning.—This is a difficult subject to write upon, but certain definite rules can be laid down. After planting, the trees should have all side-shoots cleanly cut off, and be cut down to about knee high. The effect of this will be that the tree will send out a strong healthy growth, which will be more vigorous and stronger than if the side-shoots were only shortened back to a few inches. While the young tree is growing, any cross-shoots inside and any low ones must be removed, five or six well-placed branches being left.

In the case of Plums it will be found that when this young growth is from 2 to 3 feet long, the best method is to pinch off one-third, thus forcing the tree to branch out at this point; this can be followed up in successive years until the tree has a well-furnished appearance.

In the case of Apples one should leave the first year's growth alone, going round the trees the second season just when the sap is rising, and making a small nick in the bark above the buds that appear most suitable for forming laterals; this will be found to force these buds to make growth, and consequent furnishing of the tree will follow.

This procedure should be followed on the young growth each successive season, and in obstinate cases ringbarking may be resorted to.

It is generally agreed that Citrus is better left alone, and good fruiting will result (see page 224).

The effect of winter pruning is to delay the fruit crop, each year of hard cutting back delaying the crop an equal period.

Generally speaking, trees should be left alone as much as possible, excessive pruning weakening their constitution and sapping their vitality.

General Care.—After the orchard is three or four years old, and is giving a return of fruit, it is advisable not to cultivate too much; to do so keeps the ground bare and open to the action of the sun, which will rob the soil of its fertility. Care must be taken in the use of boma manure, as there is the possibility of giving the tree too much nitrogen, and thus making it more susceptible to diseases. Excessive quantities of green manure repeatedly turned in will tend to make the land sour; a good dressing of lime occasionally will give fruit that is well coloured and sweet flavoured.

Sprays.—All fruit trees should be sprayed effectively with Bordeaux Mixture at least once a year. Any special attacks of scale, mildew, etc., can be dealt with by suitable sprays recommended by the Specialist Officers of the Department of Agriculture. It will be found that interesting experiments can be carried out with different sprays for hastening or retarding the blossoming of deciduous fruit.

Pests.—The orchardist will have to be extremely vigilant for the appearance of pests. Beginning with the young planted tree making its first young shoots, these can be eaten off into the bark by the large green locust, thus deforming the tree. Moles are destructive, and should be caught before they eat the roots. White ants should also be cleared out as far as possible.

In some parts of the country there are various kinds of fruit-sucking moths, which can do a large amount of damage to the crops. These can be caught in rain-proof traps containing sweetened Arsenite of Soda solution. Night beetles which eat foliage and fruit can be caught in the same way. Many others too numerous to mention will doubtless disturb the mind of the fruit-grower, and a little handbook on 'Sprays and Spraying,' by W. A. Larmuth, issued by Messrs. Cooper and Nephews, may be found very useful.

Dormant Seasons.—It will be found that different areas have different dormant seasons. The best districts for deciduous fruits are those which have definite seasons during which the leaves fall, and the tree has a period of rest. Long dry periods have the same effect as cold in bringing this about.

Picking and Packing.—In picking, great care must be taken in handling, to avoid bruising the fruit and damaging the tree. Losses will occur if the crop is left until over-ripe when it becomes incapable of travelling to distant markets.

Packing is most important, and certainly not a lazy man's job. Very little attention is at present given to this, with the result that large masses of unattractive fruit are unloaded upon the local markets.

In conclusion, it may be mentioned that the production of fruit, either for home consumption or for sale, presents the opportunity of a most interesting occupation. Even if one has been engaged in it for many years, there is no finality in interest connected with it. As can be gathered from the foregoing, there is interesting work connected with it throughout the year; and unless the individual is prepared to give considerable time to it, the planting of fruit-trees on the large scale should not be undertaken. Nevertheless, both the material and other rewards concerned, as is the case with gardening in general, well repay the trouble and expense involved in fruit-growing, and it is most gratifying to the grower to be able not only to use but also to see the rewards of his labour maturing in his orchard.

Further notes on deciduous fruits will be found on page 229.

GRAPES

The vine-grower in Kenya should understand that according to all experience the Colony is ill-situated for the successful production of Grapes. The latitudes in which Grapes are produced out of doors in other parts of the world exclude a belt between latitudes 20° N. and 20° S. It has been remarked by many authorities that, as the vine in this belt does not as a rule get its winter rest or dormant season, any Grapes produced are inferior or worthless. That fact has been borne out by many experiments in vine-growing in Kenya, but in recent years it has been proved that Grape production is a possibility in Kenya, given the right conditions of soil and climate.

Kenya's first commercial vineyard lies due west of Mt. Kenya at an altitude of 6,800 ft., a few miles from the Equator. Spring, when the vines are budding, commences about the end of September or early in October; and flowering of the vines occurs between the middle of October and the second week in December, according to the variety. The Grapes ripen between the beginning of February and the end of April. Autumn, or the time when the vines shed their leaves, may be taken as beginning in April, and in favourable seasons the greater part of the year's rain falls between April and August.

Varieties of vine that promise to be successful are the 'Muscadels,' 'Black Hamburgh,' the 'Muscats of Alexandria,' and 'Gros Colman.'

Oidium, or mildew, is so far the most serious fungoid disease. It thrives best in warm, moist situations, and the cure lies in dusting with fine sulphur. Certain varieties of vine are more susceptible to Oidium than others: 'Gros Colman' is a bad sinner, but 'Rose Chasselas' appears to be practically immune. Erinosis has been seen, but is controlled by the sulphuring for Oidium.

Of insect pests, a member of the Lygus family is probably the most dangerous: spraying with pyrethrum and paraffin is liable to burn the leaves of the vine, and any damage to them on a large scale would probably affect the ripening of the season's crop of fruit and of the wood. From this it will be realised that almost equally serious pests are the numerous leaf-eating beetles with which the Colony abounds. Fruit-fly may cause damage, but the grower is warned against spraying the fruit with any poisonous solution.

The routine culture in Kenya from spring on is the same as laid down in any standard English work on fruit-growing, but a few notes on pruning may be of interest.

Pruning should not be begun until the leaves have fallen. Most varieties of the vine succeed with short pruning—*i.e.* leaving two eyes; but if short pruning should prove unsuccessful, try giving the vine a few long bearers—it may not be the variety you thought it was Vines that are vigorous and productive can be pruned early, but those that are shy bearers should be pruned late in the winter. There are many systems of training vines, all of which have their merits. The simplest and most usual system for vines grown in the open is the Gooseberry Bush. One of its advantages lies in the number of vines that can be planted to the acre, as it is possible to space them as closely as 4 by 4 feet. A few varieties, however, are only successful when allowed a long permanent stem. Such a one is 'Ohanez,' of the fruit of which many thousands of tons are exported annually from Almeria in Spain. This vine succeeds best when planted 20 by 20 feet and trained over a trellis 8 feet high.

Manuring is carried out during the winter when heavy dressings of farmyard manure may be given. Small dressings of potash and phosphate are also useful.

In conclusion it may be emphasised that in Kenya the greatest difficulty experienced will be that of obtaining a suitably warm site at an altitude that will ensure an adequate winter rest for the vines.

CHAPTER XVI

TROPICAL AND SUBTROPICAL FRUITS

Introduction—Alphabetical List of Species—Fruits worth trying.

FROM the Coast up to a height of 8,000 to 9,000 ft. the climate of Kenya Colony may be described, in the brief inaccuracy of a single word, as mild; in no district inhabited by a white population is it very hot, and in no such district does any season like a real winter occur. The result is that many fruit-trees that are entirely tropical in their requirements can be grown in Kenya from sea-level up to 3,000 or 4,000 ft.; while others subtropical and less exacting, will grow from sea-level up to 8,000 or 9,000 ft. and do well. Sometimes it happens that a fruit can be grown well both at the Coast and at 6,000 ft., but indifferently at intermediate heights, no doubt failing at the latter for lack of some important factor connected with the humidity, soil, rainfall, or distribution of the rainfall throughout the year.

In addition to being easily grown, many tropical and subtropical fruits have an unusually prolonged fruiting season, or may fruit twice a year, in the Colony.

In deciding what kinds of fruit to go in for one must naturally be guided to a large extent by the success and failures of one's neighbours. But in the selection of varieties (as distinguished from kinds) it is best to take the advice of the nurseryman and to utilise his larger experience. In the selection of sites suitable for orchards, the notes given in the section on Citrus Fruits below (page 223) will be found generally applicable.

The following pages contain accounts of the most important tropical and subtropical fruits grown in the

Colony, including the temperate Strawberry. At the end of the chapter is a short list of fruits that have apparently not yet been experimented with, but seem worthy of trial.

Amatungula (*Carissa grandiflora*). The Natal Plum is a spreading spiny shrub, bearing white star-like flowers followed by small black fruit used for making jam. At 5,600 ft. the growth is slow. There are several varieties of Carissa, and *C. edulis* (page 162) is indigenous.

Avocada (*Persea gratissima*). A South American tree which grows well from sea-level to 6,000 or 7,000 ft. Nursery-grown trees usually come into bearing five or six years after planting out. The trees are very ornamental, and should be spaced about 24 by 48 feet. The pear-shaped fruit may be eaten at breakfast or dessert, in salads, in sandwiches, and with meat as a vegetable, but always uncooked. It probably has the highest food-value of any fruit, not excepting the Banana. The trees should be grown to a single stem for several feet, as they are very brittle, and large lower branches may break with the weight of the fruit. Grafting or seed.

Banana (*Musa sapientum* and *M. paradisiaca*). Most varieties grow freely at all elevations from the Coast to about 6,500 ft. Of some thirty varieties grown near Nairobi the following are perhaps the best.

The Chinese Dwarf or Cavendish Banana (*M. Cavendishii*). Largely grown in Natal and in the Canary Islands. Fruit medium-sized, rich, and very sweet.

The Ducasse Hybrid : obtained by the writer from a Natal nurseryman of that name. Fruit thin-skinned, large, white, and mealy.

The Guindi Banana, fruit small, thin-skinned, delicate, and slightly acid.

The Red Banana. There are several types, large and small, from greenish to red, all grown extensively in Uganda.

A variety introduced over twenty years ago from Tanganyika and now sold locally as Sukari is medium-sized and sweet, with a thickish yellow skin tipped green. Muchuru and Muraru are the native names of two local varieties which do well near Nairobi, having very sweet flesh, thin skins and a greenish appearance.

Bananas should be planted in rows not less than 12 feet apart, the plants being set 8 to 12 feet apart. It is not advisable to leave many suckers from one stool; usually only sufficient are left to allow for one or two to be in bearing with one or two to follow in succession. A stem only produces once and should be cut down when the fruit is taken. The bunch should be cut as soon as one or two of the fruits begin to turn yellow. It is as well to replant every three or four years, giving heavy dressings of potash and organic manure. Suckers.

Blackberry (*Rubus*). The English Blackberry grows well only at about 7,000 ft. and upwards. The white-stemmed variety, known locally as the 'Hybrid Blackberry,' grows freely from 5,000 ft. upwards, and between 5,000 and 6,000 ft. benefits from shade during part of the day. Blackberries, like Raspberries, bear on the previous season's wood, so that all canes which have borne should be cut out; only a number of the new growths sufficient for the succeeding crop should be left.

Other Berries of this family include the following :—

The Loganberry, thought to be a natural hybrid between the Blackberry and the Raspberry; grows well over 6,000 ft.

The Raspberry (*Rubus idaeus*), of which the 'Lloyd George' variety is one of the best, does well over 6,000 ft. in many parts of the Colony. To ensure regular crops the profuse suckering must be controlled.

The 'Ra-Strawberry' (*R. illecebrosus*) from Japan, also known as the 'Strawberry-Raspberry' and erroneously as the 'Wineberry,' is suited to almost every district. In a hot dry district it should be given a fairly moist situation, and, like the Raspberry, have the suckers kept down. The true Wineberry (*R. phoenicolasius*) is also from Japan. There are many indigenous members of the Bramble family, and also some American varieties which are suited to the districts over 7,000 ft. Propagation is by seeds and cuttings.

Cashew (*Anacardium occidentale*). The tree, common at the Coast, is a spreading evergreen up to 40 feet in height, and is suited to elevations from sea-level up to 3,000 or 4,000 ft. Propagation by seeds and cuttings.

Cherimoya. See Custard Apple below.

Chestnut. The Australian Chestnut, more correctly called the Moreton Bay Chestnut (*Castanospermum australe*), thrives at 5,600 ft. but has not yet had time to produce its fruit. Height, 40 feet; the tree is light green in colour, very ornamental, and propagated by seeds.

Both the Chinese Chestnut (*Castanea sinensis*) and the Spanish Chestnut (*C. vesca*) may prove suited to elevations of 7,000 to 8,000 ft.

Citrus Fruits

Citrus trees grow in most districts up to 8,000 ft.; but unless it can have the benefit of high temperatures while ripening the fruit will lack sweetness. Humid conditions are not required; in fact, the best fruit is often produced in arid districts with sufficient and timely irrigation. A deep loamy soil is usually recommended, but if consideration is given to drainage, mulching, and manuring, it will be found that Citrus trees thrive under the most unexpected conditions. They must have full sun, and where there are high winds adequate windbreaks must be provided. On slopes parallel anti-wash drains should be cut, and the contouring need not be given much thought, because the principal factors are the reduction of the catchment area and trapping and diverting the water before it begins to scour the surface. Erosion is common in Africa, and one of the most costly enemies of any form of agriculture. The lie of the land must provide natural drainage, and trees should not be planted where the roots will get into waterlogged soil. An old precept advises taking the water to the trees, not the trees to the water.

Planting. Citrus trees are generally planted when 2 or 3 feet high. Planting in straight lines is advisable, whether on the square or diagonally. Where only one line of trees is grown the spacing can be less than usually recommended, otherwise 20 to 24 feet apart is suitable.

The ground should be deeply ploughed or dug over to a reasonable depth, say 12 inches, and reduced to a fine tilth. Holes 2 to 3 feet deep should be dug, at least a foot larger in every direction than the spread of the roots when in their natural position at the time of planting. Manure mixed with the soil should not come in contact with the roots, and if white ants be troublesome there is a further danger of their causing air spaces through the consumption of any manure put in among the roots. If the ground slopes, the soil from these holes should be laid on their lower side and not replaced when planting, surface soil being used for filling in. Allowance must be made for the natural settling of the fresh soil, otherwise it will be found later that the trees have been planted too deeply; this may cause collar-rot, which attacks Orange trees planted in such a way as to bring the soil into contact with the tree above the junction of the stock and the scion.

It is very important that all exposure of the roots be avoided as far as humanly possible, and a wet sack is useful for wrapping round the roots while handling the tree between the time of unpacking and planting. Trees must be firmly planted, well watered at planting, and regularly watered until established. Two buckets of water to each tree once a week suffice if the soil has been suitably mulched.

All newly planted trees must be shaded at once, and should be shaded from the sun until they are protected by their own foliage. Whitewashing the stems is advisable, but is not a sufficient protection in this climate.

Pruning. Citrus trees should be grown on a single stem up to knee height and left unpruned. They will assume suitable shapes when allowed to grow without interference. It is usual to rub off the shoots which sprout from the stem to the knee height; but unless the stems are going to be adequately protected from sun-scald, even this is better delayed. Some varieties of Citrus are apt to become very thick, and may be periodically thinned out in the early stages, but generally speaking this is unnecessary. Some authorities recommend the pruning of Lemons, but this is not necessary although it has the advantage of improving the foliage.

Maintenance. Newly cleared land, especially if it has been under scrub, is rich in humus, and this should be conserved not only by the anti-erosion drains referred to above, but also by grass mulching and growing suitable cover-crops, whether these be weeds or planted crops. It is not to the advantage of the trees either to allow such crops to mature, or to postpone scarifying the surface of the land in order to lessen evaporation.

Young trees should be watched for attacks by caterpillar and grubs. Weevils are very troublesome, as is the caterpillar of a common Orange butterfly. When young trees have been defoliated by pests they receive a set-back from which they may never entirely recover. Scale insects should also be looked for, and cleaned off by a suitable insecticide.

Cross-pollination. Crossing by bees may take place where trees of different varieties are growing as much as a mile apart. Such cross-fertilisation has often been noticed in other varieties grown on the same estate as Navel Oranges ; here non-Navel Oranges may reproduce the Navel peculiarity if Navel Oranges are fruiting in the vicinity.

Propagation. There is usually no advantage in growing Citrus trees from seed. The trees may grow larger and last longer, but there is a great danger of their not proving true to type. In this case several years are wasted in waiting for them to come into bearing, which more than discounts any possible advantage. Propagation is usually by budding, using stocks of the 'Cape Rough Lemon' or common coast variety.

Oranges (*Citrus Aurantium* var. *sinensis*). There are many good varieties of Oranges suited to this Colony, and for general conditions the Washington Navel is the best ; the Mediterranean Sweet Orange is another early variety, growing excellently if given sufficient moisture. Both have done well on the shore of Lake Naivasha. The Zanzibar Orange is also early, but at 6,000 ft. the fruit though sweet and juicy is thicker-skinned and somewhat smaller than when grown at the coast ; the tree is rather dense and very thorny. Other good varieties are Du Roi, Jaffa, Joppa, Pineapple, Valencia Late, Leu Gim Gong, Paper Rind St. Michael, and the Blood Orange ; all these are late in ripening their fruit. Where there are two rainy seasons the early varieties are probably the most suitable to grow.

The Bitter Seville Orange (*Citrus vulgaris*), known as the Marmalade Orange, grows easily, but the fruit is often dry owing to lack of irrigation of the trees at suitable seasons. Its use is confined to the making of Marmalade, although some growers have at times used it as a stock on which to work other varieties. It comes true from seed.

Naartje. This is a South African Dutch word, and is here used to include all varieties of *Citrus nobilis*, whether Tangerine, Mandarin Orange, or the Japanese variety known as Oonshu or Satsuma. The Cape Naartje, with loose-skinned rather pale-coloured fruit, ripening early, and the Willow Mandarin, ripening still earlier, with sweet and very aromatic fruit, are the two best suited to the general conditions in Kenya. The Bombay Mandarin, like the Cape Naartje, is somewhat puffy, but grows well. The Scarlet Tangerine, Beauty of Glen Retreat and Dancy's Tangerine are all good thin-skinned varieties, with rich colouring and skin of 'kid glove' texture. They are later in ripening, and in unfavourable seasons the fruit may be very acid. The Oonshu grows under cooler conditions than the previous types. With sufficient moisture the fruit is large but not aromatic, and the pulp is delicate and juicy ; badly grown it is rather woolly.

Grape Fruit (*Citrus grandis* var. *decumana*). This American name for the Pomelo is now in general use. The fruit is borne in clusters or bunches, which possibly accounts for the name Grape Fruit. It succeeds admirably in most districts having sufficient moisture. Marsh's Seedless, Ellen, Triumph, Macarthy, and Foster are all satisfactory. Foster and Ellen Grape Fruit probably require better conditions than the others to produce good fruit.

Lemon (*Citrus Limonum*). The Lemon grows easily and under cooler conditions than the other species of Citrus. The following have all done very well near Nairobi : Eureka, Genoa or Lisbon, Spanish Lemon, Villa Franca, Sicily Lemon, and the Cape Rough Lemon. The Spanish Lemon should be tried where other Lemons are not very successful ; its fruit is large and thin-skinned. The Cape Rough Lemon requires a moister situation than the others and is not such a useful variety to grow. Lemons have thick skins when picked, and should be stored for a while for the skin to thin and greater juice content to develop before use.

Lime (*Citrus Medica*). The principal varieties are the Tahiti Seedless Lime and the Mexican, Dominican or West Indian Lime. The latter is not well suited to a cool or dry position ; its fruit is small and the flavour is good and distinct. The former grows well almost anywhere, producing an excellent and almost continuous crop of fruit. It is very resistant to most pests, and, unlike the Lemon, has abundant and very pleasing foliage.

Sweet Lime (*Citrus Medica Limetta*). The Sweet Lime when suitably grown has the advantage of fruiting when the Orange is not in season. The fruit has not the pleasant acidity of the Lime and lacks the flavour of the Orange.

Kumquat (*Citrus Aurantium* var. *japonica*). This is a very ornamental diminutive Citrus tree. The fruit is rather smaller than that of the West Indian Lime, and may be eaten without removing the skin, but is generally used for preserving in various ways. The varieties best known in Kenya are the Nagami and the Marumi.

Citron (*Citrus Medica*). Two varieties are grown in South Africa, one smooth-skinned and the other corrugated. The fruit grows easily near Nairobi, but is of little value except for the manufacture of Candied Peel. Like the Spanish Lemon but larger, with a minimum of pulp inside.

Shaddock (*Citrus grandis* var. *decumana*). There are various forms of this large fruit ; it is used for preserving, and in South Africa for making the preserve known as 'Confijt.'

Pompalmoes (*Citrus grandis* var. *decumana*). This was only the South African Dutch name for the Shaddock, but is now used for one of the Pomelo class which differs considerably from the Shaddock. The fruit is used in South Africa for preserving and the making of 'Confijt.' The trees are also used as stocks for other Citrus varieties.

The Trifoliata Orange (*Citrus trifoliata*, or *Poncirus trifoliata*, or *Aegle sepiaria*) is a three-leafleted deciduous tree often used as a stock for the ordinary varieties of Citrus. As a stock it has a dwarfing effect, but is said to improve the flavour of both Oranges and Naartjes.

Coconut (*Cocos nucifera*). Has long been grown on the commercial scale at the coast, and will succeed up to about 2,000 ft., where the Palm is sometimes grown for purposes of ornament.

Custard Apple. The name is commonly used to comprise all the Anonas, including the Cherimoya or Cherimoyer, the Sour-Sop, and the Sweet-Sop or Sugar-Apple. Almost all are indigenous to tropical America, and are usually propagated by seeds and budding.

The Bullock's Heart (*Anona reticulata*) is widely grown in other countries, but is of little value. It requires tropical conditions ; height, 20 to 25 feet.

The Cherimoya or **Cherimoyer** (*Anona Cherimola*). This is the well-known variety which grows in most districts and does best from 6,000 ft. upwards. The tree attains a height of 15 to 20 feet and there are many types. Propagation is by seed, budding and root cuttings. Excellent as a dessert fruit and in fruit salad ; usually picked while hard and kept to ripen, it is a suitable fruit for shipment.

The Ilama (*Anona diversifolia*) is tropical in its requirements, and of value in districts which are too low for the Cherimoyer.

The Sour-Sop (*Anona muricata*) demands tropical conditions, and will probably only thrive at sea-level.

The Sugar-Apple or Sweet-Sop (*Anona squamosa*), grown extensively in India, originates in tropical America. It is tropical in its requirements, and so far has not proved a success in Kenya at 5,600 ft.

Date Palm (*Phoenix dactylifera*). The Date Palm is subtropical in its requirements, and unless grown solely for ornament it must have a climate corresponding to that of Northern Africa, with its very high summer temperature both night and day. There are other species, including *P. reclinata*, which are native to tropical Africa, all of which are very ornamental. Propagation is by seeds and suckers.

DECIDUOUS FRUITS

These are described in Chapter XV, but it seems worth while to draw attention here to the fact that hybridising has created varieties of some of the deciduous fruits common in Europe that are subtropical in their requirements, and do well in Kenya from about 5,000 ft. upwards. A few of these may be mentioned.

Peach. Hybrids, with the Chinese Peach as one parent, have proved subtropical and even tropical plants. Many grow very well between 5,000 and 7,000 ft., including Alexander Jewel, Angel, Florida Crawford, Hall's Yellow, Jewel, Killiecrankie, Shackleford, and Waldo. Probably the most tropical variety is Peen To, the flat Chinese variety.

Pear. The three subtropical varieties best known in Kenya are Keiffer, Le Conte and Smith hybrid. Elevations of 6,000 ft. and over are the most suitable.

Plum. Varieties of the Japanese Plum (*Prunus triflora*) yield fairly satisfactory results between 5,000 and 6,000 ft. given sufficient moisture, and grow well over 6,000 ft. The following varieties are recommended : Abundance, August, Burbank, Chalco, Climax, Gaviota, Hale, Kelsey, Maynard, Methley, October Purple, Santa Rosa, Satsuma, Shiro and Wickson, but of the last nine varieties all but Maynard are advised for planting below 6,000 ft. It is usually advisable to plant several varieties both for cross-fertilisation and to have a longer fruiting season. Satsuma is more or less sterile unless grown with others. Propagation in all the above instances is by grafting.

Feijoa Sellowiana. The Pineapple-Guava is a shrubby tree 10 to 15 feet high, and now cultivated in California for its Guava-like fruit. See page 103.

Fig (*Ficus carica*). Although in their natural habitat the Figs thrive under arid conditions, they should have a moist situation between 5,000 and 6,000 ft. near Nairobi. They do best at elevations over 6,000 ft. and the slopes of the Rift Valley appear to suit them well. The popular varieties include Brunswick, Brown Turkey, Castle Kennedy, White Adriatic, and White Genoa. Propagation is usually by cuttings and budding, and the plants are best grown to a single stem for the first 2 feet or so.

Gooseberry, Cape (*Physalis peruviana*). The Cape Gooseberry is very well suited to elevations of 5,000 to 7,000 ft., and should grow in all districts. It is better treated as an annual, is easily grown from seed, and produces an abundance of excellent fruit, used for stewing and preserving.

Granadilla (*Passiflora*). The Purple Granadilla (*P. edulis*), or Passion Fruit, is probably the best known. It thrives in most districts between 5,000 and 8,000 ft. and may be suited to lower elevations. The growth of the vines is very rapid; on wire fences one or two leaders and a few laterals can be trained horizontally and the other growths restrained by regular pruning.

Granadilla perfecta is an improved form of *P. edulis*, producing very much larger fruit, which at 5,600 ft. does not appear to ripen so well as does the smaller variety.

The Golden Granadilla or **Sweet Granadilla** (*P. ligularis*) is known as the ‘ Pomme d’Or,’ and ranks next in importance to *P. edulis*. The vine is quick growing, with cordate acuminate leaves about 6 inches in length; the ripe fruit is orange to orange-brown, sometimes shaded purple. It is suited to elevations of 5,000 to 7,000 ft.

The Sweet Cup Granadilla (*P. laurifolia*), known also as the 'Yellow Granadilla,' is a very ornamental climber, bearing fruit 1½ to 2 inches in length, of excellent flavour, but contained in a very hard shell. Grows well between 5,000 and 6,000 ft., and probably at other elevations also.

The Giant Granadilla (*P. quadrangularis*) is more tropical in its requirements than are the other species, and although growing well at 5,600 ft. sets fruit much more freely at slightly lower altitudes. The fruit is up to 10 inches in length, and in appearance somewhat resembles a greenish vegetable marrow.

The Tacso (*Tacsonia mollissima*), allied to the Granadillas, is valued as a fruit in Columbia, where it originates. In Kenya it is usually grown as an ornamental climber, and thrives at elevations over 6,000 ft.; below this it should have a moist situation. See page 129.

Guava (*Psidium Guajava*, syn. *Psidium pyriferum*). This tree is easily grown; up to 25 feet in height. It bears an abundance of highly flavoured and rather musk-scented fruit, which is especially useful for fruit salads, stewing, and making into jelly, jam, or Guava cheese.

The Strawberry Guava (*Psidium cattleianum*), known as the Cherry Guava; thrives in this Colony from 5,000 ft. up. The plant is of shrubby habit and ornamental. The fruit has not the muskiness of the ordinary Guava, is reddish purple in colour, and is used as a dessert fruit or made into jelly.

The Pineapple Guava (*Feijoa Sellowiana*) is described on page 230 above. Propagation of Guavas is by seeds, cuttings and root cuttings.

Jack Fruit (*Artocarpus integrifolia*) grows and fruits at the Coast and as high as Nairobi, where it may be seen at the Arboretum. The trees are handsome, growing to 70 feet. The fruit is borne on the bark, is very large (specimens having weighed 80 lb.), and unpleasantly scented. There are many varieties, and propagation is by seed.

Jujube (*Zizyphus* spp.), spiny trees growing to 30 feet, which produce small oblong fruits ½ to 2 inches in length. The fruits are eaten fresh, or dried, when they somewhat resemble dates. There are many species and varieties, the Chinese varieties being considered the best. Hot dry conditions are likely to be the most suitable. *Z. jujuba* is indigenous from Coast to 4,000 ft., but the fruit is inferior, and only the large-fruited Chinese varieties are likely to be worth growing. Propagation is by seed, grafting and root cuttings, but generally by suckers, as they do not come true from seed.

Kei Apple (*Aberia caffra*). This small spiny tree produces yellow fruits that are of use for making into preserves. The Kei Apple is dioecious, so both male and female plants are necessary for the production of fruit, and these cannot be distinguished in the seedling stage. It is well suited to all districts from 5,000 ft. up, and very drought resistant. Propagation is by seed, cuttings or layers. See page 178.

Litchi (*Nephelium Litchi*). Young trees at 5,600 ft. are most promising, but have set no fruit in the first two seasons. A moist situation is advisable, and the spacing should be 25 to 30 feet. The trees are ornamental and the fruit is borne in large clusters. There are several varieties in cultivation, the fruit of some being best suited for drying and of others for eating in the fresh state. The Litchi is slow from seed, and layering is largely resorted to.

Loquat (*Eriobotrya japonica*). Sometimes called the Japanese Medlar or Japanese Plum. This very ornamental evergreen tree has large dark green foliage and clusters of bright yellow fruit, suitable for dessert or making into jam and jellies or stewing. The seeds impart a bitter flavour and should be removed before cooking. The trees should be spaced 25 feet apart and will grow in all districts above 5,000 ft. Propagation is by seed and budding. Some varieties produce comparatively large fruit, but even good varieties produce small fruit in a dry year or when the trees are overladen, and some years may not flower or fruit at all.

Mango (*Mangifera indica*). These handsome trees, with dense and evergreen foliage, grow very well at all elevations from sea-level to 5,600 ft. When planting, those suited to the locality should be selected, as all will not fruit at the same elevations. Some of the Mangoes from the Coast bear well near Nairobi, others seldom set fruit there. The setting of the fruit is to some extent dependent upon insects, which transfer the pollen; attacks of mildew, scale and beetles are very detrimental. Comparatively dry conditions, particularly during the flowering period, are advisable, and rich deep soil is generally recommended. Mangoes do not usually come true from seed, so inarched or budded trees are the best. It is difficult to lay down any definite rule for spacing, as in some countries Mangoes attain an immense size with age; budded Mangoes, however, do not grow to the same extent, and planted 24 to 30 feet apart will be suitably spaced for a reasonably long period. The fresh fruit is suited to export.

Melons (*Curcubitaceae*). Require dry conditions, and both Water Melons (*Citrullus vulgaris*) and Sweet Melons (*Cucumis Melo*) have done well in the Kedong and at Machako's. When grown near Nairobi the time of sowing should be selected so as to avoid attacks of mildew and damping-off. Seed.

Monstera deliciosa. The Cerinam is a handsome aroid, but scarcely worth growing for the sake of its edible fruiting spadix. It is described on page 137.

Mulberry. *Morus nigra*, the large black-fruiting Mulberry generally grown in Europe and South Africa, will not grow in Kenya at 5,600 ft. Other varieties, however, can be grown in all districts over 5,000 ft., their foliage resembling that of some of the White Mulberries (*M. alba*) grown elsewhere for feeding the silkworm.

Olive (*Olea europaea sativa*). Two varieties of Olive are indigenous, but at 5,600 ft., near Nairobi, the Olive of commerce has proved very slow, evidently requiring less tropical conditions, and is more likely to succeed over 7,000 ft. than below that elevation. Propagation is by seed, cuttings, budding and grafting.

Pawpaw (*Carica Papaya*). The Pawpaw, like other members of the *Passifloraceae*, grows exceedingly well over a wide range of conditions. The fruit may be eaten in many ways: as a breakfast or dessert fruit, in fruit salad, cooked in the green state as a vegetable, pickled unripe, made into jam either alone or with other fruit, and made into sauces. The leaves when placed in contact with meat for a few hours before cooking have the property of rendering it tender. Pawpaws grow well up to 6,000 ft., but the best flavoured fruit is produced at the lower altitudes. They are normally dioecious, so both male and female trees must be grown. As the trees age the males, which have the small staminate flowers, become bisexual; there is generally a large preponderance of male trees, and these in the early stage are usually the more robust. Propagation is usually by seeds, which retain their vitality for several years. The seedlings, or, in fact, the plants of any age, do not transplant satisfactorily except in wet weather. At planting about three-fourths of the leaf blades should be trimmed off, and the plants well watered and shaded. The trees bear at about 18 months, and are in bearing for about half the year.

The Mountain Pawpaw (*Carica candamarcensis*). The fruit grows to 4 inches in length, and has a pleasant acid and perfumed flavour; both pulp and seeds are eaten, and the juice is useful for flavouring fruit salads, etc. The tree grows well at 5,600 ft. and should prove suited to most districts of the highlands. It bears at 18 months to 2 years; propagated by seed.

Pecan Nut (*Carya oliviformis*). Some young trees are growing satisfactorily near Nairobi, and should prove suited to districts from Nairobi upwards. There are several varieties in cultivation, and the nuts form a valuable article of commerce.

Persimmon (*Diospyros Kaki*). The Japanese Persimmon grows well from 6,000 ft. upwards and will fruit at 5,600 ft., but the growth is slow. In some countries the fruit is very popular, and it is suited for export to Europe. Propagation by budding and grafting.

Pineapple (*Ananas sativus*). The pineapple, a native of tropical America, grows in all districts from the Coast to 6,500 ft. The most popular variety in Kenya is the *Smooth-leaved Cayenne* or Kew Pine. It is the large-fruited variety with spineless leaves; very juicy and of a pleasantly acid flavour. The *Queen Pine* is smaller, less acid, very mealy and excellent in flavour. Other popular varieties are the Charlotte Rothschild, which is not unlike a large Queen Pine, and the Black Jamaica.

Pineapples grow easily in full sun in almost any soil; the fruit keeps better where the conditions are dry during the ripening season, and is sweetest where the temperature is highest. Each plant bears one fruit, thereafter sending out fruit-bearing suckers. It is best to remove and plant the suckers before they approach the flowering period. In addition to suckers, propagation is effected by crowns, gills (offsets below the base of the fruit), cuttings of the stem split longitudinally, and, in the case of some varieties, seed. The best spacing is 30 by 30 inches, with every third omitted to allow room for cultivation and picking. Pineapples will not thrive in shade, and replanting should be carried out at least every four years.

Pitanga (*Eugenia uniflora*). This is possibly the best of the Eugenias both for utility and ornament. The tree forms a compact shrub with glossy dark evergreen foliage, the new growth being of a rich wine colour. The fruit is scarlet and should be quite ripe when eaten raw, but is more suitable for preserving or stewing. As an onamental tree or used for hedges it is very effective. The height is up to 25 feet, the growth slow, and propagation is from seed. It grows very well both at the Coast and near Nairobi, and is probably suited to all districts.

Pomegranate (*Punica Granatum*). This grows freely throughout the Colony from the Coast upwards, and makes an ornamental hedge. In hot arid places, especially where the roots can find sufficient moisture, the fruit is of better quality than that produced under humid conditions. The principal pests are the False Codlin Moth and Fruit Fly; the fruit is a very usual host for the former, which may do considerable damage to Oranges, Naartjes and Custard Apples. Unless one is very young the fruit is apt to be disappointing eating. Propagation is by seeds, cuttings and layers.

Strawberry (*Fragaria*). Many varieties have from time to time been imported into this Colony, and doubtless those most suited to the conditions are amongst the survivors. They grow best from 6,000 ft. upwards, planted in rows 3 to 4 feet apart with a foot between the plants. The land should be moist and well drained. With many varieties replanting is advisable at least every two years, and March appears to be the best time for this. When grown in dry districts the edge of a swamp is probably the best position. From 7,000 ft. upwards the Alpine Strawberry grows and fruits well. Strawberries are liable to attacks of Leafspot (*Mycosphaerella fragariae*), and these are best treated by spraying with Bordeaux Mixture; if the infestation is heavy, it is advisable to cut off and destroy the foliage before spraying, and to repeat the spraying when the new growth has been produced.

The **Frutilla** or **Chilean Strawberry** (*Fragaria chiloensis*) would possibly bear all the year round at the higher altitudes of the Colony, say 8,000 to 9,000 ft., and should be worth a trial.

Telfairia pedata. The Mkweme Nut, a robust climbing plant indigenous to Zanzibar, grows very freely at all elevations from sea-level up to at least 6,000 ft. The rough dark-green ribbed fruits contain numerous Nuts which can be used like Almonds. The vine is so vigorous that it soon requires more space than the ordinary garden can afford, unless severely pruned. Both male and female plants are necessary, and these cannot be distinguished before the appearance of the flowers. Propagation is by seeds and cuttings.

Tree Tomato (*Cyphomandra betacea*). This is a quick-growing short-lived plant of the Solanum family. Height, 6 to 10 feet; it comes into bearing after eighteen months, thriving at elevations of 5,000 ft. upwards, and producing clusters of three or more egg-shaped fruits. Before cooking the skin and seeds should be removed, and if the fruit is to be stewed, the addition of a small quantity of sodium bicarbonate counteracts the astringency.

Walnut. The common Walnut (*Juglans regia*) grows and fruits at elevations over 7,000 or 8,000 ft. Propagated by seed and grafting.

FRUITS WORTH TRYING

Many fruits grown elsewhere in tropical, subtropical, and temperate climates have not yet been tested in Kenya, but seem worthy of a trial at the appropriate altitudes. A few of these are listed below.

Babaco (*Carica pentagona*). Allied to the Pawpaw. Hardy, and likely to do well above 6,000 ft. where the Pawpaw fails. Seed.

Bread Fruit (*Artocarpus incisa*). A quick-growing tree 40 to 50 ft. high. Coast up to 3,000 ft. Propagated by seeds and cuttings.

Capulin (*Prunus salicifolia*). Wild Cherry. Many varieties; should grow in the cooler districts that are unsuitable for the ordinary Cherry. Propagated by grafting.

Coco-de-Mer (*Lodoicea seychellarum*). Slow-growing, ornamental Palm, dioecious. Suitable for the Coast. Seed, germinating in two years.

Durian (*Durio zibethinus*). Large handsome tree, fruit of doubtful flavour. Suitable to moister parts of the Coast. Seed.

Eugenia. Besides the Pitanga (page 235), several varieties are worth trying, up to 6,000 ft. or more, as ornamental trees with edible fruit, including *E. Jambos*, the Rose-Apple. Seed.

Mangosteen (*Garcinia Mangostana*). Small tree, fruit excellent. Suitable to moister parts of the Coast. Seed.

Pistachio Nut (*Pistacia vera*). Small tree, height up to 30 ft. May do well at 7,000 ft. and over. Seed.

Sapodilla, Sapote (*Lucuma* spp.). Trees of small or medium size with edible fruit ; some varieties might grow well at the Coast, others in the highlands. Seed.

Spondias mangifera. Small trees probably suited to Coast and medium altitudes, Mango-like fruit. Seed.

Tamarind (*Tamarindus indica*). Large handsome trees, suitable for avenues or shade ; fruit used in commerce. Many varieties. Seed.

Walnut. The Black Walnut of N. America (*Juglans nigra*) should do well at over 7,000 ft., and the Japanese Walnut (*J. Sieboldiana*) at that altitude and lower. Seed.

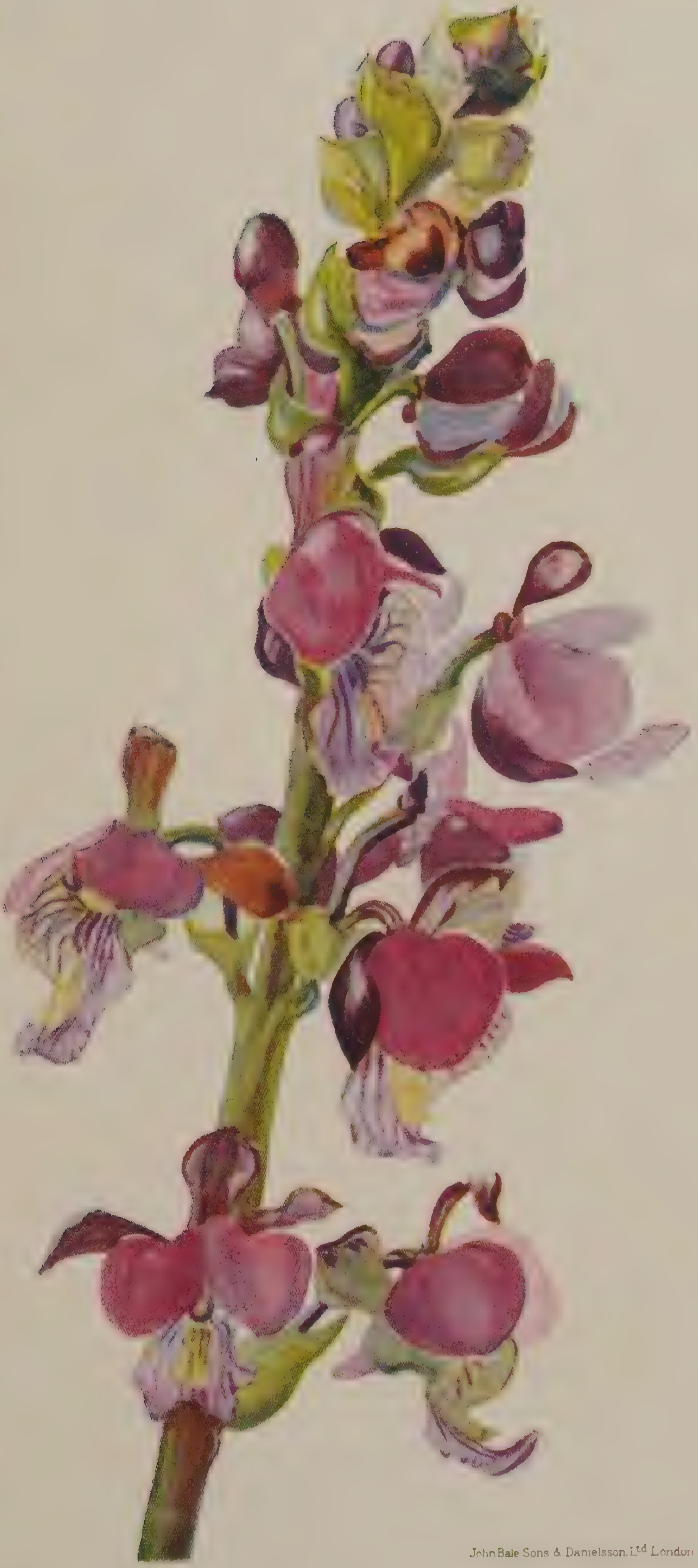
CHAPTER XVII

GARDENS AT THE COAST

Before endeavouring to write anything on Coast Horticulture I ask my readers to forbear with me and my sins and omissions, for doubtless they will be many. There will be too much 'I' and what I have done. I am sorry, but I have cut out as many as I can. The Kenya Coast is not by any means easy to write about horticulturally. It has so many sides to its character; so many contradictions and anomalies with which to contend. It is the forbearance of Coast readers and experimenters that I particularly want. If they try something and fail they must not blame me. All life, let alone horticulture, is fashioned out of failures. Because a plant grew and flourished with me one year is no reason that it will again the next or ever with some other person. Neither do I want the reader who has grown things not mentioned by me to say 'Pouff! This is no good; why, I grew so and so and they did marvellously, and the writer does not know what he is talking about.' It matters not to me if such remarks are made because I shall not hear them. But I do not want anyone to take it for granted that only things I have mentioned will grow, or that I am going to take a seedsman's catalogue and write down long lists of plants. There are a thousand and one things still to try, and all the fun is getting something new to look really well and happy in congenial surroundings. By well and happy I do not mean Snowdrops in Nairobi or Violets in Lamu. Such sights give me the same feelings as a Primula or Azalea does in the gas-laden atmosphere of a room in England in winter time. To digress; cut flowers in such rooms I should always have. They would fade and die away in any event. But I cannot bear to see healthy denizens of the pure air being slowly poisoned unnecessarily. There should be, if there is not one, a Society for the Prevention of Cruelty to Plants.

I will now return to Horticulture on the Kenya Coast, and I believe I am trying to dodge it. By the Coast I mean the land from the sea to Voi and the borders of Ukamba, but not the Teita Hills ; and all the land up to the Italian Boundary ; the Tanaland country and the Northern Frontier desert lands. It is all patchy and it all has affinities. Some parts of the Taru Desert are like the Northern Frontier, and the land behind Lamu is like that near Vanga. So they cannot well be separated. The next thing I boggle at is the word Horticulture. It is so easy to drift into Agriculture or Arboriculture. So by Horticulture I mean anything pertaining to gardens, be it tree or banana or Brussels sprout.

Some people will never garden. You must love your garden and your plants and they will know it and respond. Indeed you must do this or you will give up in disgust or die of a broken heart or ‘ dudu-mania,’ the madness caused by insect pests. Your plants will not respond with love, but to love, because love means infinite care and patience and commonsense. If you have not got these, do not garden anywhere and more particularly not in the Kenya Coast lands, for you if do you will surely fail. In no part of the world that I know is it so necessary for the gardener to be at heart a gardener and not merely one who likes to see a nice garden. If you are one of these latter folk and rich, buy a gardener and try to buy one with love in his heart ; and bribe him heavily to love your garden as though it were his own ; then you may have a perfectly ideal paradise of flowers. If you cannot afford this, then the next cheapest thing to do would be to buy lots of artificial moss, and glass or metal flowers ; make some nice beds, cover them with the moss and stick in your glass or metal flowers ; for it is your only chance of a garden on the Coast, without love. There is of course an even more drastic remedy which I whisper to you and that is—‘ Don’t garden.’



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LISSOCHILUS PORPHYROGLOSSUS.

See page 169.

Now if you have read so far and are still determined to go on, I will try to tell you the little I know. So bear in mind the love-touch and listen.

Generally the Coast means a very hot and fairly damp climate, but this is not always so. It is patchy. You have areas of very dry conditions, others where you may get mists and cold nights like Kwale, others where it is always hot, night and day, and there is little or no moisture except for a month or two in the year. Then lastly there is the Tana country where you have no topside moisture to speak of, a torrid heat, and only the subsoil moisture from the Tana River. We must however definitely look on all Kenya Coast gardening as tropical.

The rainfall all along the Coast itself averages 37 inches in the year. Further inland and on the central Tana it is about 20 inches. There are places where it is more; probably I should say in the country immediately behind Lamu and near Vanga it is over 40 inches. But even in the wettest parts this, for the tropics, is a dry climate, though it has a higher rainfall than many parts of wet England. So Coast gardening must be termed dry gardening really.

While we are discussing rainfall, we will discuss water. There is only one large permanent river on the Coast, and that is the Tana. There are the smaller Umba and Sabaki rivers. There are a few small streams, but I know of no gardens on them and I only know of the Tana where there is a garden under irrigation. The water used for gardens is either piped, as in Mombasa and Kilifi, or carried from springs, wells or streams. The pipe water at Mombasa is at least safe, most stream and spring water is safe, but that from wells may very easily be disastrous, as so many of the wells have contents injurious to some if not all plants. So beware of wells.

As we are talking of water let us talk of watering. It is a most difficult thing anywhere and particularly on the Coast. I have always found that in any country to water well and to drench the soil through and through as seldom as possible is infinitely better than a daily splash of water.

I prefer to see my plants becoming a little weary and wilted and then to give them a good douching. The irregular watering pertains more to natural conditions and allows the soil to sweeten, which it will not do if it is always wet and waterlogged or has a wet cake on top. Much more damage still can be done in the Tropics by this light watering. The surface soil is moist ; underneath it is dry but comparatively cool. The roots come up to the moisture ; then the moisture by midday has dried out and the growing tips of the delicate roots are burnt and you get poor half-dead plants. So I think it is worth making it a very definite rule to water as seldom as possible and then to water well. The continuous plying of the hoe and fork will do infinitely more good than this slapdash watering. It is not easy to get your native gardener to do it. He simply loves the ‘ lick and a promise ’ system.

Of course I do not mean by watering the beneficial spray by hose or hand applied to the foliage of the plants in the very early morning or late evening. It is generally beneficial, but not to all plants.

The other kind of watering is irrigation, but there is nowhere on the Coast except on the Tana River where this is really possible, I think, and no one would want to go to the Tana merely to have an irrigated garden. But if you can irrigate anywhere, be careful and do not over-saturate your soil. You will turn it sour. To irrigate correctly is a high art, of which I for one only know the very rudiments. One over-irrigates ; one always over-irrigates ; and wretched plants that must have some time to rest and recuperate are expected always to be blooming. So, tropical irrigating gardeners, beware, or the Society for the Prevention of Cruelty to Plants will be after you.

It is hardly worth discussing altitude because there is really none. Kwale is at 1,200 ft., but it makes only a slight difference in what you can grow, and I am describing that later.

But soils, of course, do matter. They matter immensely. Generally one starts off and clears ground of grass, bush, stones or forest, and for one or two seasons everything is marvellous, and then comes disillusion. Flowers start to grow and die, vegetables become mildewed, and shrubs grow down instead of up. Perhaps you have grown marvellous Cinerarias in a shady nook. They never grow again. Do not be put off. You are expecting too much. This myth of the wonderful fertility of African soils is exploded. They have a superficial fertility for from a year to ten years perhaps. I should put the period at two years generally. This is only natural; what has been put into it? And of the stuff put in by nature how much is yearly washed away? The moment we clear and prepare for planting the sun gets at the soil and burns the goodness out of it. After all, the wonderful gardens in Europe are on land which has been cultivated off and on for perhaps 2,000 years and is still being improved. Think what has gone into its making, and do not be disappointed. Send samples of your soil to be analysed; make good its deficiencies; do not expose too much to the sun, and plant closely to give shade. You can always thin out. Finally do not dig too deeply, at first at any rate, or you will probably get a very sour subsoil on top. Work deeper by degrees, and always keep moving the surface soil by hoe or fork and pointed stick.

There are many kinds of coastal soils. There is the soil of the immediate littoral, which is a very rich but sparse red loam over coral rag. In some places it is heavy, and in others tends to work down into pure sand. Then at Kwale you have, generally speaking, a light reddish soil which appears to my non-geological mind to be decomposed granite or sandstone. It will grow nothing but grass and a few specialised plants, except where it is slightly richer and forest has spread. Then you have the pans of heavy sour black cotton soil; it will, when worked and cultivated grow more things than many other soils. There is also the Coast forest soil, which appears rich on the surface but is very poor beneath. There is the Taru Desert soil like much of that in the Northern Frontier which could, if it but got shade and water, grow anything. There is the Lamu soil of pure sand, and the Tana River flats all of the lovely rich Kikuyu soil brought down in suspension and deposited by floods on the low-lying riverlands. It will grow almost anything ; but all the humus is burnt out of it quickly by the scorching sun before ever it gets a coat of vegetation on it.

Keep all garden refuse and have a pit for it, and water it occasionally if possible. It will make invaluable leaf mould or manure. If you are clearing very rich soil it is a good plan to lay evenly over the soil all the dry grass and rubbish that you can collect and burn it. You will thereby destroy untold millions of weed seeds and the eggs or larvae of insect pests. I have suffered several times through neglecting to do this.

Now before discussing plants, gardens and dream gardens, there still remains the question of shade ; shade from wind and shade from sun. They both require care and attention. Trees are the best wind-break, but on places at the Coast it is almost impossible to get them to grow. If you can, plant them thick and use indigenous ones when possible ; or if you are starting fresh right on the sea and you have bush, leave a belt of it between the sea and your garden. It can be made quite attractive. If you must plant, use *Casuarina* or *Terminalia* and the maritime flat-topped acacia. The latter grows on some parts of the Coast right to the water's edge and makes delightful shade and a wind-break. There are the alternatives of a wall or fence of some kind, but they are not generally so nice and are probably more expensive. Besides, a wall will only shelter small things. For sun shade I would recommend belts of tall-growing trees on the western side of the garden. They will then throw shade from midday onwards, and it is the afternoon sun which plays havoc with the plants, I am sure. Plant your more tender flowers along the eastern and northern sides of your house or any other walls. But not by the house if there is an open space under it ; it is murder to plant there in such circumstances. Of the trees for throwing shade I recommend *Cassia fistula*, *Terminalia Catappa*, *Phyllostachys*, or *Casuarina equiseti-*

folia. They all grow straight up and do not spread too much. If you have masses of room *Poinciana* is also useful, but it spreads too far for a confined space. I am not thinking of the above trees so much ornamentally as usefully. I should not combine flowering shrubs and trees with this belt. They would take up the shaded ground where one wants the garden.

Then there is artificial shade; but it cannot be made to look really nice, and should be confined to vegetables or cutting flowers. There is the exception, of course, of the creeper-covered trellis or pillar screen for giving a narrow band of shade. That should also be on the south and west of the beds to be shaded. Whatever you do, do not over-shade. Artificial shade should be very thin, made of split bamboos or withies or palm leaves, but the intermediate spaces should be large. Remember we want to break up the sunlight, not keep it out, and as the world moves so each plant will get its share of light and shade. No light-loving imported plant, at least, can thrive cut off from the sun any more than human beings can, but it needs the same semi-protection.

Now I shall describe the gardens I have made on the Coast. I have made others up-country and the work has been easier and the results generally better, but the satisfaction from the difficult Coast ones greater.

My first effort was in 1913–14. It was a small square of coral round a small bungalow near the golf course at Mombasa. There were the usual crotons, oleanders, tecomas, frangipanis and aralias, and casuarina trees. My efforts were small. I dug out myself three rather large grave-like pits, and filled them with all the soil I could scrape up in the pockets of the coral round about. They were one at each end of the house and one in front. When the rains broke I planted them thickly with all kinds of annuals. They nearly all came up, the majority quickly died off and the minority throve and flowered. There was no colour-scheme or design. The flowers were cosmos, the pink and white shaded one and the orange one, annual gaillardias, coreopsis, phloxes, marigold, dianthus, and mignonette. The rest of the coral I strewed with seeds of cosmos, African periwinkle and zinnias. I planted clumps of *Russelia juncea*, euphorbia (Christ's Thorn), allamandas, yellow and violet. This was for the November rains, and until January I had a simple but bright garden full of bloom. I repeated the dose in April and had good results ; and then the war came. My next gardening effort was in Jubaland, at Yonte, in 1916. It appeared that the troops would be there for many months at least ; so I wangled some money out of the Mess President to be spent on vegetables only. I sent for my seeds including a few flowers. I had a fatigue of K.A.R. to clean ground near some mangoes and coconut palms. I put in an Egyptian shadouf to raise water, and managed to get two oldish Sudanese askaris told off as gardeners. I prepared my soil and planted my seeds. I noted that all natives planted very thickly, so I did likewise. This was in April. By the middle of June we had masses of beans, lettuce, spinach, beetroot, peas and radishes. My flowers were only balsams, zinnias and phlox, and they were not appreciated. Needless to say I evaded many parades through providing the mess with vegetables. I merely had to say that unless the garden was cared for there would be no vegetables. Then when tomatoes, carrots and even cabbages were coming on, away I was sent to German East Africa. There I did not garden.

Then back I went at the end of 1917 to Jubaland, and away up to the north to Serenli. My lesson in 1916 had not been enough for me. I started again, and things were all promising when I was ordered off for nearly a year on patrol on the Abyssinian Frontier. That was early in 1918. So I gardened no more till I went to Wajir in the Northern Frontier in 1920. Wajir is a Beau Geste post in pink sand bush desert, with a few flat-topped acacias giving it a superficial prettiness. Its wells are full of slightly medicinal clear water. I thought a lot about gardening there, and at last I fell. It appeared no use at all to try to grow things in the burning hot sand beyond dates, and I planted masses of them. My other activities were to build stone troughs (stone and lime were plentiful) along the north and east walls. I made them about 3 ft. wide and 2 ft. deep. I filled them with soil from the bottom of a nearly dried out lake, with manure and sand. I watered them well and planted my seeds. Strange, too, in spite of the slightly alkaline water, practically all vegetables but potatoes and carrots grew well, but only zinnias, balsams and petunias among flowers would grow. I did not overwater, but watered well when I did it. Gourds and cucumbers climbed on wires up to the top of the house, and I had for eighteen months a good supply of vegetables. Then I left. Now only the date palms remain.

From there to Shimoni near Vanga was a far call and I did no gardening ; but shortly I went to Kwale, and there one simply had to get down to it again. There were some fairly good teak and other exotic trees planted by the Forest Department, and the remains of very fine croton and hibiscus walks around the old Forester's house. They had been planted and left several years before by a very early resident in Kenya and one who still takes a keen interest in her plants in Mombasa ; of course everything was overgrown and desolate. I arrived one cold evening when a strong wind was blowing, so, to amuse myself till my porters came, I started to burn out the old rubber plot. It was a lovely blaze. So I burnt out most of the other old plots, only cleaning round and preserving from fire odd fine specimens. The Forest Guard ran into Mombasa to report to the Conservator of Forests that I had burnt down all the experimental plantations. I worked very hard at cleaning and making roads and grass planting. I did not make out any definite plan for the station. It just grew. I think it is the same with most gardeners. You may have a general scheme, but other ideas are born as the work progresses. I stayed there longer than I have yet been anywhere in Kenya. It was from 1922 to 1926, off and on. I clipped all the old crotons and hibiscus back. There were only four trees of the latter and some twenty-five of the former.

I planted all the clippings as hedges or specimens. I gave them my blessing and hoped they would grow. I hacked off huge chunks of the greedy bamboo near the house, and planted them in the further distance as specimens. Beware of bamboo, by the way. He can look so soft and green and bending, but he will send his roots for yards and yards, simply robbing everything else of its very subsistence. Use him in the distance only for silhouettes at sunset or moonrise, and where he can only rob grass. But whatever you do, do not cherish him near you. I ransacked the gardens of Mombasa and Frere Town and the Government station at Mazera's for seeds, cuttings and plants. I got all kinds of seeds from the Forest Department. So I got frangipani, *Cassia grandis* like pink laburnum, *Cassia fistula* like yellow laburnum, bombax, a tree with lovely yellow single rose-like flowers, duranta, many different hibiscus, oranges, limes, coffee, roses, and palms including *Livistona* and *Caryota urens*, the wood of which is so hard that it is made into spear heads in the East. The hibiscus and crotons seemed to like being chopped off and put in shallow trenches. They all grew, and the hedges got longer and longer. My idea was to get neat red roads, trim brightly coloured hedges, and large spaces of grass with odd specimens dotted about, and all set in a bay of the virgin forest. So far flowers had not been important, but as this work gradually became finished I turned back to them and homely vegetables also. First I became interested in the local ferns, of which there are many, and started a fernery on my verandah. My 'Bird's Nest' ferns were my *pièce de résistance*, and some of the filmy Selaginellas. They grew so well that they grew right out of the verandah. Some folk said 'Very lovely, but you must be swarmed with mosquitoes." I never had any, and my friends can bear me out in this. Mosquitoes do not come from clean gardening but from insanitary back quarters. I grew all kinds of vegetables, including potatoes and watercress (at the spring), in a garden which was on a patch of forest scrub. I had my vegetable garden always here. I used no fertilisers, but lots of leaf-mould and all the decayed rubbish and burnt station refuse. My next work in the flower line was to collect the local wild things and try them. I took the lovely buff Gladiolus, the yellow and purple ground Orchids, the Tiger Orchid of the Dôm Palm trees, the brick-red Asclepias, the white petunia-like flower that springs up and smells so sweet after the grass fires, and scores of others of the forest, desert bush and grass lands. I found they all ill repaid me for my care, or interference perhaps. They either grew into coarse bushes or gradually faded away. The Dôm Palm Orchid, the Ferns, the Gladiolus, red Asclepias and a white sparaxis-like flower were the only appreciative ones. The rest, I fear, liked to be burnt out every few months, or choked with bush or trampled flat by cattle. They certainly did not appreciate my kindness however much I tried to give them natural conditions. By this time most of my trees and things were getting well away. There were blue and lemon gums already there, and they were fairly happy. There were Grevilleas, Jacarandas, and Poincianas, none of them at all happy. I had planted Cypresses, and Macrocarpa was thriving and still is doing so I believe ; most of the Cassias were happy as were also Albizzia, Parkinsonia, Bixa, Terminalia, the Circassian Bead Tree. Creepers which were really happy were *Bignonia venusta* and other Bignonias, Bougainvilleas, Ipomoeas, *Solanum Wendlandii*, and two white sweet-smelling wild ipomoea-like creepers with large tuberous roots ; white, purple, orange, yellow and pink Bauhinias were all thriving. I next added fibrous-rooted begonias, violets, arum lilies, caladiums, heliotrope, and fuchsias to my fernery. I then added roses of named varieties, which did all right from cuttings and if not too heavily pruned. I started an enormous circular bed of well-prepared soil for all Europeany garden plants, and also one or two borders. In my bed I had dahlias, pansies, tobacco, antirrhinums, sunflowers, verbenas, phloxes, stocks, asters, mignonette, violet queen and rose petunias, dianthus, pentstemons, and others I forget. Of these stocks, asters, pansies and pentstemons did no good, so I gave them up. In my borders I had a number of salvias, *splendens*, *patens* (blue), white, the purple-velvety one, and the purple one like *splendens*, and they all did well. There were tuberoses, belladonna lilies, cannas, verbenas, chrysanthemums, gladioli, watsonias, Madonna lilies, gerberas, ageratum, dimorphotheca, eschscholtzia, and lots of other annuals. Everything I mention thrived except the Madonna lilies and gerberas and eschscholtzias. I have never got eschscholtzias to do well anywhere except up-country. I tried cinerarias and primulas, but they were no good. My last effort was to plant the odd mounds about the stations with the various verbenas, and they flourished for a year or so and I believe all died out. My ideas, as I say, came to me at odd moments, but my main theme was to get a neat restful space of lawns with light splashes of colour in hedges, beds and creepers, all toning into and being absorbed by the forest behind me, and in front falling away into the forest-covered hills and valleys gradually receding to the sea fifteen miles away. I wanted no harsh lines between the handiwork of man and nature. My only silhouette was a clump of coconut palms on a slightly rising ridge between me and the sea. They only broke the sea line. They did not hide it. They were due east, and at dawn or moonrise their outlines were too beautiful for words. I hoped to add to their effect by planting a clump of bamboos also on the sky and sea line of this hill. I thought their graceful feathery blackness etched into a rose-gold dawn or a silver-blue rising of the full moon would make another perfect vignette. But some years later I went to look for them ; they had been choked with weeds and then burnt out in a bush fire.

Again to digress, the curse of practically all Coast gardens is the lack of continuity. In my case, as an official I am always being moved and the perfect whole is lost ; my successor perhaps has other interests. It is the same with most of the Coast population, and so a perfect garden is almost an impossibility. I then left Kwale and made my next garden at Marsabit ; but that is not by any means Coast, so I shall now describe my latest effort on the Tana

River. I must first describe my country. There is the Tana River winding away from Mt. Kenya and the Aberdares, for its last 250 miles as the crow flies and goodness knows how many as the river winds; it is flowing through typical Northern Frontier Desert Bush. It averages about 150 yards wide. It has a varying belt of luxuriant tropical vegetation, and this looks a pitifully small riband of green when seen from the air. The country is hot and dry as Hades. The rainfall is about 20 inches, but very uncertain and patchy. The soil generally is poor, but in places good, and really good where the river floods, and it floods considerable areas. The only appreciably cool time is from July to November. In March and April plants just dry up and die of heat. At my particular spot a slight ridge of dry gravelly soil runs right up to the river. About 400 yards along to the north-west it falls to the level of very high floods. My house stands looking north-west and nearly towards the river, on the edge near the depression. This land was all desert bush or impenetrable river forest eighteen months ago. The cleaning was done so as to interfere with nature as little as possible; even desert bush and scrub were left where possible and the forest cleaned up, not cleaned out, except for a vista from the house. The ground was well dug up, and three Egyptian shadoufs and a small hand pump installed, so that practically the whole garden can be irrigated. Under the big trees and in the river vista Indian dhoob grass has been planted and has made good lawns. In these there is no definite line. They just fade off at the end of their irrigation into the desert or the forest. Flower beds are on the river banks at the side and front of the house. The vegetable gardens are behind the house, and beyond the furthest flowers. They are all irrigated. It is just as well they are, because there has only been one month's rain in the last year and a half. The house does not stand in the garden but about 25 yards from it, and except for a small enclosed lawn and shrubbery behind the house (irrigated) and tub plants it is standing in the pinkish desert sand. So in front to your left and slightly behind you is green and vegetation, and to your right desolation except in the rains when the desert becomes a veritable paradise of bloom, green, and scents. Here, the house and garden are not nestled into one another or into the forest as at Kwale, but the house stands outside and looks into the garden and on to the river. On the opposite bank of the river I have planted flame trees among the forest of Tana Poplar, Wild Fig, and Kigelia growing there. When in bloom they should look perfect in the green setting and reflecting in the river.

The lawns always keep green even in the very driest, hottest weather, provided they get enough water. Now what do I grow or have I tried to grow ? Why, everything nearly. First I can grow all kinds of vegetables but potatoes, artichokes and peas (except in the cool months). The rest all grow, some fairly and some very well. All the tropical fruits are growing and thriving. I mean citrus of all kinds, mangoes, figs, Cape mulberries and gooseberries, coconuts, dates, and passion fruit. About six different sorts of bananas grow, look well, and their fruit tastes better. All the Coast trees grow mostly very well. The main ones are *Cassia fistula*, *C. grandis* and *C. florida*, Thevetia both yellow and salmon, Bauhinias, the Indian Almond (Terminalia), the flame tree (Poinciana), Oleanders, the Indian horse-radish tree, Crotons and Hibiscus (from Kwale cuttings), Aralias and Acalyphas, the Pride of Barbados (*Caesalpinia pulcherrima*), Tecoma, Bignonias and Bougainvilleas. There are also growing many sorts of semi-tropical trees ; some are doing quite well in spite of the heat. The best ones are blue, lemon and iron-bark gums, and also a rarity from New Guinea (*Eucalyptus naudiniana*) which is growing well, *Cupressus pyramidalis*, *C. glabra*, and Lawson's ; *Grevillea robusta* and Jacaranda. And there is my own masterpiece, a hybrid frangipani (*Plumieria*). A friend in Tanganyika who had a very good one he brought from India sent me seeds. They grew and flourished. I planted out everywhere my pink frangipani. But what a surprise it had in store for me ! It was a hybrid with the common one, and I have nearly each tree with different sized, different coloured and slightly different scented flowers. They are from pink to white and lemon-yellow, and enormous, some nearly as big as magnolias. Many kinds of palms are growing as well; the main ones are wild date (*Phoenix reclinata*), *Arenga* or sugar palm, *Elaeis* or oil palm, two kinds of cocos and two of phoenix palms. They show a will to thrive inasmuch as many look well, and only for one month in their lives have they had rain on them.

In my actual garden effects I have cut out all colour schemes: in fact I do not believe in them in a tropical garden. Let the colours mix as they will: the green tones everything into its right setting. The brightest colour and combination of colours are needed in a land of high lights. I have gone in chiefly for bold masses of common things. One of all coloured cannas, eighteen different shades and markings, intermixed with the red-leaved semi-shrubby hibiscus and white datura is perhaps the best. Masses of petunias and orange cosmos, phlox and ageratum backed with yellow and orange African marigolds, large masses of zinnias, gaillardias and coreopsis, scarlet salvia and miniature yellow sunflowers all are there, and all mix up well. Then I have that lovely deep wine-red wild hollyhock from damp places, and a lovely little shrubby convolvulus-flowered plant of the desert places which covers itself for a day or two every two or three weeks of the year with the most lovely soft mauve flowers. Bold masses of coleus and deep purple and soft pink petunias all flourish and vie with one another. And the Torenias, most delightful little snapdragony, orchidy looking flowers in purple and mauve, or gold or white, are very much at home. Asters and antirrhinums grow quite well, but the asters remain very dwarf. Chrysanthemums seem happy, but only grow tiny flowers; tobacco, purple and pink salvias including *Salvia van-Houttei* all grow, but not so well as up-country. I plant gladioli everywhere and they are very happy. I get a few fresh ones every year, from South Africa in October for the short rains, and from England in February for the long rains. They are cheap and well worth the little they cost.

Then in shady places I have the various Impatiens. Zinnias are marvellous. The first crop they are good and produce enormous flowers, the second they are better and grow into great branching bushes. Then you must get new seed, for they deteriorate. Finally, there is the standby of my houseboys, the ordinary balsam. It is, I think, in the garden a stodgy, good-natured plant, and it will grow anywhere. I quite like it. But use the flowers for floating in bowls for house decoration. They are perfect. They look like tiny pink or white roses or miniature camellias.

Now I will describe the one or two gardens on the Coast that I know—and in fact there are only two real ones, and one of those is just in Tanganyika. The one in Tanganyika is unique in a way. It surrounds a house that stands in a square of forest in the middle of a sisal estate. There are vistas through the wood to the sea and the hills. There is no true gardening in one sense. There is a terrace in front of a long low house, and under the wall of the house a bed and on the top of the terrace a bed. Near the house grow caladiums, anthuriums, begonias, clivias, dracaenas and ferns. In the terrace edge border grow gladioli, tuberous begonias, tuberoses and more caladiums. That is all there is that is really garden, but in the wood are colonies of all kinds of tropical shrubs and plants. Their master likes them all sweet and heavily scented, and they are mixed with palms, crotons, cassias, petreas, ixoras, allamandas violet and yellow, and cycads. When last I saw it things were only just beginning to grow. If luck has attended it, by now it must be a perfect tropical garden of overpowering scents. The owner is a true gardener when he is there, but he often wanders into the unknown wilds. By a true gardener I mean he will go off after dinner with a torch lamp to try to catch a wily beetle who nightly eats some exotic beauty; or he will be sad at breakfast and say, 'Poor *Ixora inamorata* is dead; what shall I do? Shall I go to Durban by the next boat to get a near relation of hers?' That is the garden where my own children, the hybrid frangipanis, came from. The one thing I always want to steal from there is *Anthurium crystallinum.* It grows well and its leaves are a perfect exotic joy of deep green velvet and crystal. The other garden I mention belongs to a lady in Mombasa. She has only a tiny square of coral-rag round her house; or it was coral-rag, now it is flowers. It does not even seem to be soil. She pretends to be very casual about her gardening, and tries to make you believe her boys do it all. Do not believe it. I have seen her long before six in the morning walking round, peering in here, probing there, having a chat with a Maréchal Niel rose or smacking her lips over a juicy young cucumber. There is not a plant or particle of soil she does not know in that garden. Her husband when he wants to please her gives her a present of a few donkey-loads of manure, knowing this will drive away any gathering storm like spring winds on a May morning. I cannot describe that garden or what is in it, because everything is there. There is not any room, but they are all there at some time or other—roses, lilies, dahlias, gladioli, hydrangeas, azaleas, cannas, coleus, geraniums, Beaumontia, bignonia, begonias, antigonon, and ferns, and every kind of annual you like to mention. The only formal thing is a circle in front of the house. In its centre there is a bird-bath, then a lawn slightly larger than the bird-bath, and then segment beds of roses and annuals. She sells pounds and pounds' worth of flowers from that rubble heap of coral-rag yearly for charity. She is the perfect gardener lady. If you want to garden in Mombasa and you know her, ask her advice before you start. If you are strangers make friends. It will be easy if your basis of friendship is gardening. I suppose there are other gardens in Mombasa. There are enclosures with a few trees and shrubs in them, I know, but they are not gardens. They are compounds. I believe at Kilifi there is quite a nice lawn, and that can, if well kept, be a joy in itself.

Well, I have told you *ad nauseam*, perhaps, of the gardens I have made or known. So now I will tell you of one I am going to make. It is right on the edge of the sea, and it had, when started, but one very fine and good old date tree in it which leans a little towards the sea. It is only about thirty yards by thirty yards. To the east is the sea, to the south the sea and sparkling white sandhills covered by very green flat-topped acacias. To the west is a very, very old mosque with its minaret. It is all greeny-grey and lichen covered, and on the north is the house, a low white building with a red-tiled roof and green shutters. Round the garden is a wall nearly six feet high, except on the sea side. There is a double door let into the wall, which is the only way into the outer world. The soil is almost pure sand and in parts a little red earth. It has been well manured and lots of virgin soil has been added to it, and the whole covered with white sand. It has been planted thickly with all kinds of tropical shrubs and trees, crotons, oleanders, *Cassia grandis*, poinciana, frangipani hybrid, citrons, coconuts, dates, hibiscus, jasmine, and ixora. The walls have petrea, bougainvillaea, bignonia, ipomoea, and jasmine planted by them. There is one path from the door in the wall to the door of the house, and it is bordered with cannas, pancratiums, hymenocallis and belladonna lilies, zinnias, phlox and petunias. All the plants are thick, because I want a perfectly heavy shade and only a little sunlight to filter through on to my white sand. By manuring heavily I can keep most of my things going. Along near the sea wall and overshadowed by the old date palm is to be a long narrow tank of water ; the concrete will be coloured with cementone, a light blue beneath the water, and the coping soft green. Beside this pool a pelican with softest pink plumage, ruby eyes, and a beak shaded in blue and pink and yellow and cream, sits grotesque and inscrutable as Time. That is not quite all. Through the other big double door into the house which stands wide open you look into a cloister-like court, surrounding a small lawn. The cloister walls are cream, doors and windows opening on to it are all of nearly black wood, the floor is tile-red cement, the roof is red tiles and the pillars of stone cream-washed. There is a well in the corner with an old green coping-stone, and over it and up to the roof straggles a red bougainvillea ; on the edge of the cloister half-way between each pillar is a pale green concrete flower-tub, and in each one a large coloured leaved coleus. On the fourth side, that is, the service quarters, are planted fairly close together a row of tangerine trees. They are attractive whether in fruit or bloom or only in leaf. That is all. To be quite frank, this garden only half exists. It is my dream garden. It is only beginning, but it will do before long and I think I must charm one pyramid cypress to grow beside my well.

I am not going to write about seeds and cuttings. Everyone must learn from experience, but I will say—do not overwater or overshade. If you have got a high north or east wall, under that is the best place for your nurseries. Neither am I going to make lists of things that will grow; nurserymen's catalogues will tell you that. My advice is try things, especially annuals. You can get seed cheap enough to start off with. I have found Ryder's twopenny packets quite good. Then try every season whatever you can afford in trees or shrubs for tropical gardens; but do not try too many things at first.

I have not said much about vegetable gardens. Practically all vegetables given fair and sensible treatment will grow, but do not waste your time on peas and potatoes, rhubarb, sea-kale, parsnips and most of the cabbage family. You may get a poor crop of any of them, but they are not worth it.

There are the three types of gardening one may indulge in : the mass of flowers, the formal, and the botanical. I think for the Coast the formal is perhaps the best, then the flower mass. The botanical garden is for the scientific mind only. In Mombasa one could do so much with the formal garden. It should be kept fairly small, it should be slightly below the level of the ground or have a slightly raised concrete or dry stone curbing. The sunken garden has the best effect. It must have some kind of edge to it or you cannot water sufficiently well; and when it is sunk you can flood it occasionally on very dark nights when no water-works official can possibly see you. Such a garden should be on severe lines and have only one or two even and regular beds for roses and gladioli or for cannas. I advise any amateur to begin with cannas. They are marvellously good-natured and give quick effects. If you do grow roses, get good old-fashioned sorts grown from cuttings in this country, and see that they have good roots when planted. Imported budded roses are no good. They are very cheap. And mind your roses do not get their roots eaten by white ants. You must lift your gladioli when the leaves turn yellow, and it is advisable to get a few new bulbs every season. It is good to have a bed near your tank if you have water, to get reflections, but they should only be at some points ; you can keep your water free of mosquitoes by introducing the minute fish (Tilapia), used by the people of Lamu to keep their wells free from these pests. You might try pyramid cypresses, one in each corner of your garden. It is no good saying they will not grow at the Coast. There is, or was, a very good one many years old near Messrs. Smith Mackenzie's bungalow at Kilindini. You need a coping to your tank, and you can get that done in concrete in any colour that may please you. If possible, have your garden looking north or east, or shaded by something from the south and west. Put the good old standby shrubs of Mombasa in the rest of your garden, fairly thickly, to give shade to all the ground. If you are very 'corally' give them pretty big holes with good soil to start off. If you do not like a formal garden and want a mass of flowers then you must give them much more attention, remove all coral-rag, and spend money on manure ; and again, unless you are very rich, do not do too much at once. And for Heaven's sake do not get despondent ; you will have many griefs and disappointments, but your successes will be as balm to your soul.

CHAPTER XVIII

GARDENING IN UGANDA

Introduction—Soils, Cultivation and Manuring—Propagation—Annuals—Perennials—Roses—Flowering Trees and Shrubs—Climbing Plants—Bulbous Rooted Plants—Indigenous Plants—Lawns—Hedges—Foliage Trees—Vegetables—Fruits—Pests and Diseases.

When people come on from Kenya to visit Uganda, they frequently make two comments: firstly, 'How green the country is!' and, secondly, 'What good roads you have!' In those two sentences are summed up the main differences between the conditions affecting horticulture in the two countries: for many parts of Uganda, and especially those west of the Nile, are not subject to such periods of drought as occur in many parts of Kenya; and the soil, which by virtue of its compactness and hardness, forms an excellent road-making material, unfortunately has a tendency to exhibit the same attributes when it is used as a flower-bed.

And, of course, Uganda is warmer than the highlands of Kenya: the difference lies not so much in a higher temperature by day, as in the fact that the nights are less cold. This difference, though slight, in conjunction with the more evenly distributed rainfall, has produced much more luxuriant vegetation, and Uganda, in consequence, is referred to as a tropical country, by which term is conjured up a vision of steamy heat like that of West Africa. In reality, the climate of Uganda is very different, but it is hard to classify; for while it is sufficiently warm and moist to enable the growth of most tropical plants, yet it is cool and dry enough for many plants of subtropical and temperate regions.

The result is that an astonishing range of vegetation is possible—one may see Cacao and Lavender, both growing fairly well, within a few yards of each other.

There is much in common between the problems of gardening in Kenya and in Uganda, and the various aspects of the subject have been dealt with so fully in the preceding chapters of this volume that the present one will be merely an attempt to indicate the differences between the two countries, and to suggest modifications to meet the local conditions in Uganda. The number of species described is amazing, and a large proportion of the plants have not yet been tried in Uganda, where there are comparatively few people of wealth and leisure; but it is to be hoped that many of our enthusiasts will profit by the information, and be encouraged to make new introductions. In this connection, it is worth remembering that if a plant is said to flourish from 5,000 ft. upwards in Kenya, it is worth trying it in Uganda even as low as 3,800 ft., for with our more equable climate it has a good chance to survive.

SOILS, CULTIVATION AND MANURING

It has been mentioned above that the soils in Uganda are generally heavier than those in Kenya; there is considerable variation among our soils, but there are few parts which are fortunate in possessing deep friable loams like those in the Kiambu area in Kenya. In Uganda, cultivation should be deep, because the compactness of the soil will discourage the deep rooting habit, and cultivation must be careful, or hard clods may result; frequent hoeings are needed to prevent the formation of a crust.

In order to obtain a better outlook, dwelling houses are usually built on hills, and this introduces a further complication, for there is little soil on many of the hills in Uganda: they owe their existence to the fact that they are covered with a cap of murram, which has resisted denudation. Whenever it is possible, it is advisable to bring in good soil to make up the garden; if that process is too expensive, mulching and manuring will of be great benefit. In most parts of Uganda there is an abundance of grass available for mulching: Elephant Grass, *Pennisetum purpureum*, is an excellent material for the purpose.

With regard to manuring, in many places in Uganda boma manure is not so easily obtained as in Kenya, and further, some people are prejudiced against its use. If it is very fresh, it is said to cause scorching of plants: if it is old, the greater part of its nitrogen content may be lost: it is also stated that it has been responsible for bad attacks of Eelworm, and on this account it is better not to employ it with young seedlings.

There is in Uganda, however, one manure not obtainable in such large quantities in Kenya, and that is cotton seed, which has been proved to be of great fertilising value. It is better not to dig in the fresh seed, as much of it will germinate and constant hoeing will be required to kill the seedlings. If, however, the seed is put in a pit, covered with soil, and kept moist, it will ferment and the germinating capacity will be destroyed in two weeks; the resulting product will have a vile smell, but if it is forked into beds, the plants will quickly respond.

Imported fertilisers are expensive because of the cost of freight, and in consequence are not used to any great extent, with the exception of sulphate of ammonia. This has proved to be invaluable as a dressing for lawns, killing out the weeds and stimulating the grasses, and in consequence is applied in considerable quantities to the greens of some of our golf courses.

PROPAGATION

For this work, a plant house with roof and end walls of glass and open sides is admirable; the roof is lightly whitewashed, and plants grow excellently without further shading—for example, Fuchsias, which grow badly out of doors in the sun, will flourish inside. Boxes and pans of seedlings or of soft cuttings are placed under the staging in the daytime, but must be kept on the staging at night in order to avoid the attentions of crickets.

It has also been found to be well worth while to sterilise the soil in which are sown seeds of any new plants. Such seeds are usually sown in earthenware pans, made locally, which are nine inches wide and five inches deep, with sloping sides, and three drainage holes. The pans are prepared for sowing in the usual manner and then three of them are placed in a pile in a kerosene tin containing about one inch of water; the tin is put on a fire and a cover placed over the top. After the water has been boiling for an hour, the pans are removed and allowed to cool before the seeds are sown. Not only are any fungi killed and the risk of damping-off reduced, but there are destroyed any worms or insects, together with any seeds present in the compost: the last point is a distinct advantage, as it is often hard to recognise the seedlings of little-known plants. The pans are never watered from above: when the soil becomes dry the pan is placed in a larger pan containing about three inches of water, and is left there until the moisture has reached to the surface of the soil. There is one disadvantage to the use of sterilised soil: the seedlings tend to be somewhat stunted, but when they are pricked out in ordinary compost, they grow rapidly.

ANNUALS

The culture of annuals in Uganda is often less successful than in Kenya: this is due in part to the hotter climate, and, in part, to the methods of cultivation employed. The average shamba boy, when making a flower-bed, does not dig the ground—he merely scrapes all the loose soil into a mound in the centre: on the top of the mound a few flowers are planted, and are surrounded by steep bare soil, which in turn is surrounded by the exposed subsoil at the edge of the bed; and into this subsoil will drain any rain that may fall on the bed. In order that the plants may have a chance, the whole bed should be dug deeply, and manured if possible, and made with only a slight slope towards the centre: if these precautions are taken, good results may be obtained even on quite poor soils.

There is seldom a month during which no rain falls in all but the driest areas of Uganda, but as a rule there are two wet seasons and two dry seasons each year: better results with annuals usually may be obtained during the first wet season, as that is longer and less uncertain than the second rainy period. Whenever annuals are planted it is safer to shade them, for there are few days, even in the wet seasons, during which there is no bright sunshine.

In the country to the east of the Nile, the dry seasons are more intense than they are in Buganda, Bunyoro, and the Western Province, and in consequence the conditions under which gardening must be undertaken are more difficult. In Toro and Kigezi, which are high and cool, the climate facilitates the cultivation of many temperate plants, as in the highlands of Kenya.

The number of annuals mentioned in Chapter VI is so large that it is not possible to deal with each individual species; therefore the better-known kinds have been divided into three lists:—

(A) Those which are easily cultivated in most parts of Uganda.

(B) Those which grow fairly well at low elevations (*circa* 3,800 ft.), but flower better at higher altitudes.

(C) Those which are suited only to the cooler parts of the country.

(A)	(B)	(C)
Amaranthus	Alonsoa	Brachycome
Arctotis	Antirrhinum	Calceolaria
Argemone mexicana	Calendula	Clarkia
Browallia	Callistephus	Dianthus barbatus
Celosia	Campanula Medium	Dimorphotheca
Coreopsis spp.	Centaurea spp.	Eschscholtzia
Cosmos	Chrysanthemum	Godetia

(A)

Cynoglossum amabile
Dianthus chinensis
Gaillardia
Gypsophila elegans
Helichrysum
Iberis
Impatiens
Linaria
Mina lobata
Nicotiana
Nigella
Petunia
Phlox Drummondii
Portulaca
Tagetes spp.
Zinnia

(B)

Delphinium, 'Blue Butterfly'
Larkspur
Sweet Peas
Linum
Lupinus
Matthiola spp.
Nemesia
Pansy
Phacelia campanularia
Salpiglossis
Tropaeolum
Viscaria

(C)

Lavatera
Lobelia
Mimulus
Nemophila
Oenothera spp.
Papaver spp.
Reseda odorata
Scabious
Schizanthus
Ursinia
Viola

PERENNIALS

The dry seasons in Uganda are seldom so prolonged that it is not possible to obtain some show with perennial plants throughout the year: few gardeners in this country are so fortunate as to be able to irrigate, but judicious conservation and application of the bath water will do much to help. Many of the plants described in Chapter VII cannot be grown in most parts of Uganda; others are best treated as annuals, and have been included in the lists in the previous section: short notes are appended on some of the genera which are of especial interest in Uganda.

Angelonia angustifolia is not grown to any extent in Uganda, but should be a most useful plant, as it flourishes in many hotter countries.

Asters (Michaelmas Daisies) are easily grown and spread rapidly; but should frequently be divided and replanted, or few flower spikes will be produced.

Begonias (*fibrous rooted*). The tall types (e.g. *B. coccinea*) are very handsome if grown in shade, and are useful pot plants on verandahs. The small fibrous-rooted kinds (e.g. *B. semperflorens*) will flourish even in the open, and spread rapidly by seed in shady corners.

Carnations grow well, and are most useful for cutting: the substance of the flowers is much greater when the plants are grown at high altitudes, but if disbudding is attended to, quite good blooms may be produced even at 3,800 ft. The addition of lime to the soil appears to be of definite benefit to the plants; but when they are over twelve months old they sometimes die off very rapidly, owing to fungus attacks, and in consequence it is advisable to keep a supply of young plants of all good types.

Chrysanthemums are fairly successful at about 3,800 ft., but form larger flowers at higher altitudes. The plants should be divided frequently and replanted in rich soil, or they will be stunted, and badly attacked by aphides.

Coleus must be shaded to obtain large brightly coloured leaves, and make effective pot plants: any very good types may be multiplied by cuttings, which are easily struck.

Delphiniums. Unfortunately the herbaceous types seldom grow well, except in the higher districts, such as Toro. The sweet-scented, white-flowered native *Delphinium candidum* has flowered well in gardens at Kampala and Entebbe, but its growth is very erratic. It appears to be biennial and at times will seem to be dead, but with the advent of the rainy season it will produce new leaves and a tall branching spike of flowers.

Erigeron mucronatus is a valuable plant for covering steep slopes and the sides of drains: in such positions its growth is compact and floriferous, but in shady places it tends to become leafy and to bear few flowers.

Gerbera. In Uganda, as in Kenya, this plant is easily grown and very beautiful.

Gloxinia. The garden varieties may be grown from seed, and with careful treatment will flower freely as pot plants. *Gloxinia* (*Sinningia*) *speciosa*, an erect plant with blue-mauve flowers, grows well as a pot plant or in moist shady places.

Hollyhocks will flower well in many places when the plants are twelve or eighteen months old.

Lavender (*Lavandula vera*) forms compact low bushes with silvery leaves, but does not appear to flower below about 6,000 ft. The growth of *Lavandula Spica* is very stunted : *L. dentata* promises to be of some value.

Mirabilis grows very well, and appears to have become naturalised in some places.

Pelargoniums are easily grown, but sometimes do not flower very well : the Ivy-leafed types (*P. peltatum*) often grow better than do the erect (*P. zonale*) varieties.

Pentstemons are well worth cultivation—they flower freely at most altitudes.

Rehmannia angulata does not seem to flower well in Kampala, though it does so in Toro.

Salvia. As in Kenya, so in Uganda, this genus contains many plants of great value ; most of the species mentioned in Chapter VII are easily grown and will stand full sunshine, but *Salvia patens* requires shade and moisture.

Verbena. The procumbent varieties are widely grown : the erect *Verbena venosa* is a useful border plant.

Vinca madagascariensis is valuable to fill in dry places where nothing else will grow.

Violets grow in all districts so long as they are kept fairly moist, and flower freely ; they do well in shade.

Roses. Although the individual blooms of Roses in the lower parts of Uganda have not the same substance as the flowers grown at higher altitudes, yet these flowers are some of the most important ones in our gardens. If the plants are growing strongly they do not suffer greatly from pests and diseases ; therefore it is highly important that the ground be deeply dug and well manured before planting Roses.

Many of the varieties which are of the greatest value in Uganda are older, strong-growing types, which are best planted at distances of 2 or 3 feet apart.

The majority of Roses in Uganda are grown on their own roots, for cuttings of well-ripened wood, about 18 inches long, strike easily; but care must be taken not to transplant such cuttings too quickly—shoots a foot or so in length usually are produced before there is much root growth.

FLOWERING TREES AND SHRUBS

If, in the matter of Roses, Uganda cannot compete with Kenya, yet, as regards flowering trees and shrubs, it scores; for while almost all of those described as flowering near Nairobi may be grown at about 3,800 ft., the higher temperature enables many more tropical species to be included in Uganda gardens. The following notes are intended to be supplementary to Chapter IX, for in most cases the advice given therein applies equally well to Uganda.

Brownea speciosa. A large spreading shrub which frequently produces its compact heads of red flowers at Entebbe; probably it would flourish better under light shade.

Buddleias grow well, both *B. variabilis* and *B. madagascariensis.* It is a good plan to cut down the plants nearly to ground level once a year, at the commencement of the rains, for this causes the production of finer flower spikes, and avoids the unsightly mass of dead branches that often is seen.

Caesalpinia pulcherrima in Uganda is a valuable shrub, almost always in flower; besides the orange-flowered type, there is one which bears butter-yellow flowers.

Cassia. In this genus we can grow some beautiful plants which do not flower well at Nairobi.

C. alata forms a large shrub, pleasant in foliage and bearing spikes of orange-yellow flowers.

C. bacillaris is an erect shrub with creamy yellow flowers.

C. fistula does not seem to be grown in Uganda, but should be of great garden value.

C. grandis and *C. moschata* grow well but do not flower very freely.

C. javanica forms large spreading trees; a good specimen when covered with light green leaves and clear pink flowers is one of the best sights to be seen in any garden. It is, however, not so good when the flowers and leaves have fallen and it bears only the long dark seed-pods with their evil-smelling pulp.

C. multijuga forms a quick-growing small tree, with delicate foliage and light yellow flowers. It deserves to be more freely planted.

C. siamea is more remarkable for the rapidity of its growth than for the beauty of its flowers, and is therefore mentioned below under the section Hedges.

C. spectabilis is a quick-growing tree, bearing terminal inflorescences of bright yellow flowers.

Erythrina. Besides the two species mentioned in the section under Native Plants, one introduced species has proved itself a valuable tree—*Erythrina micropteryx.* When it is in leaf, it forms a large shapely spreading tree ; but when the leaves have fallen, and it is covered with bright orange flowers, it is magnificent. Other species which grow in Uganda comprise *E. glauca*, a medium-sized tree, *E. Corallodendron*, and *E. Crista-galli* which forms a small dwarf shrub, but freely produces its dark crimson flowers.

Fuchsia. None of the species or varieties can be grown well in the open except in the cooler parts of Uganda, but when planted in pots and grown in the shade, beautiful specimens may be obtained.

Gliricidia maculata forms a quick-growing small tree, with long feathery branches : once a year it produces masses of pale pink flowers. It is easily propagated by large cuttings, 6 feet long and 2 to 3 inches in diameter, planted *in situ* : a certain amount of pruning usually is required to form a shapely tree.

Hibiscus Rosa-sinensis in its different varieties is one of the most useful shrubs in Uganda ; the plants grow rapidly, can withstand drought, and are almost constantly in flower.

H. schizopetalus is very attractive, but is less robust.

Hydrangea hortensis will flower in Kampala, but the plants must be heavily shaded, and are best grown in pots.

Jacaranda mimosifolia. This tree is often much maligned, for when it becomes established, youthful exuberance causes it to produce long erect unsightly branches, bare except for a few leaves near the top ; however, after a few years it usually settles down to form a shapely tree, and to bear flowers regularly.

Melia Azedarach is very quick growing in Uganda, and for about two years it is quite decorative ; but after that it becomes ill-shaped and unsightly, and therefore should not be planted as a permanent tree.

Mesua ferrea grows rather slowly at Entebbe, and has not yet flowered.

Peltophorum. *P. ferrugineum* is a medium-sized, spreading tree with feathery leaves and large panicles of yellow and brown flowers ; it should be planted more frequently.

P. africanum var. *speciosum* is taller, more erect in habit, and less showy in flower.

Poinciana regia. In Uganda this is a most useful tree, as it has so many virtues ; it will grow on poor soil, its habit is good, its foliage is beautiful, and its flowers are glorious. It forms an admirable flat-topped spreading specimen tree on a lawn ; and, in fact, it is best planted thus, as the colour of the flowers is such a clear bright scarlet that they will harmonise with those of few other plants ; for example, they make those of *Spathodea nilotica* look positively muddy.

Solanum macranthum quickly forms a medium-sized spreading tree, and is especially suited to sheltered positions. The large leaves, and the abundance of flowers, at first violet but fading to white, render it a striking object.

Tithonia diversifolia. A Mexican shrub, naturalised in Uganda, growing to a height of about 8 feet, and with flowers like small sunflowers ; it is somewhat untidy in habit, but forms a useful screen for unsightly corners.

CLIMBING PLANTS

In Chapter X there are described a large number of climbers which are not well known in Uganda, and the value of many of them has not yet been proved. Mention will be made here only of some of those which have been tried already.

Antigonon leptopus, 'Corallita.' A most useful small climber, although it does not flower in Uganda quite so freely as it does in really tropical countries: the white-flowered form is not so beautiful as the pink one.

Aristolochia. Several species are grown in Uganda, but with the exception of *A. elegans* they are so rampant and make so little show of flower that they are not worth planting in small gardens.

Bignonia. Three species only are commonly grown in Uganda—*B. magnifica*, *B. Tweediana*, *B. venusta.*

B. magnifica is a strong woody climber, constantly in flower, but the flowers are magenta coloured.

B. Tweediana is a rampant clinging climber, rather dingy for several years, until it commences to flower.

B. venusta, 'Golden Shower,' is the most popular climbing plant in Uganda; often it makes little growth for many months after planting, but when it does start, it will soon cover a wall.

Bougainvillea. All the species and varieties are vigorous woody climbers, often hard to control. 'Mrs. Butt,' for all her beautiful colouring, in other countries has proved to be the worst offender in this respect, and should be planted against a tree or as an isolated specimen plant, rather than trained over a house.

Combretum *spp.* These are mentioned below in the section on Native Plants.

Ficus repens, 'Zanzibar Ivy.' This is a most valuable creeper for covering unsightly walls, to which it adheres so closely that it harbours few insects. In Uganda it will stand exposure to full sun, but in order that it may start to grow rapidly, it should be planted in rich soil.

Ipomoea *spp.* All those mentioned in Chapter X will grow well in Uganda ; and some of the native species would be worth cultivation.

Maurandia. *M. Barclayana* grows well ; and the coarser *M. scandens* (syn. *Lophospermum*), with large pink flowers, grows very rapidly.

Petrea volubilis. One of the most beautiful climbers in Uganda, but it is hard to propagate.

Quisqualis indica. This is quite an attractive climber, but it is very rampant, and it is liable to throw up suckers many yards away from the parent plant.

Stigmaphyllon ciliatum. A climber as yet little known in Uganda, but of proved value ; its growth is rapid, and it is very attractive in foliage and in flower.

Vanilla. The Vanilla of commerce, *V. planifolia*, will grow quite well in the warmer and moister parts of Uganda, but it requires rich soil and shade. It is of interest rather than beauty, with its thick leaves and peculiar clinging roots : when the vines are in strong growth, the yellow-green flowers are freely produced ; and if these are pollinated artificially the aromatic pods may be obtained.

BULBOUS ROOTED PLANTS

Many of the species mentioned in Chapter XI have not yet been tried in Uganda, although among them there must be several which would flourish in and greatly enrich our gardens. Some types are already common in gardens—the value of Agapanthus, Crinums, *Hippeastrum equestre*, Hymenocallis, Montbretia and Zephyranthes is so well known as to need little comment.

Begonia. The rhizomatous species make a good show either as pot plants or in shaded beds : of this type, the round-leaved *B. manicata* is one of the most useful. The tuberous rooted Begonias are not successful in the garden, and are best grown only as pot plants : with care they may be raised from seed, but in order to obtain large plants it is better to buy the tubers, and to discard them after they have flowered once.

Caladium. The varieties in Uganda are worth growing, although they are not so good as some in other countries. In order to obtain large brightly coloured leaves, plant in rich soil, and keep them well shaded.

Cannas are too well known to need much mention : in Uganda, as in Kenya, they should be given as rich a soil and as much moisture as possible, and should be divided and replanted once a year.

Cyrtanthus. These plants flower well in Toro, and probably will be useful at lower elevations.

Dahlias. Useful and easily grown garden plants, with two flowering periods a year : they are easily grown from seed, but the plants thus obtained seldom produce flowers so good as those of the named varieties, which are propagated vegetatively.

Eucharis grandiflora. This is a very pleasing plant, but it must be grown under moist conditions, and receive some shade : in order that the waxy white flowers should be freely produced, it must not be disturbed too frequently : it makes a good pot plant.

Gladioli. Fine spikes of flowers may be obtained when the plants are not attacked by the Gladiolus Fly ; but these pests are all too prevalent in some places, *e.g.* Kampala, while at others, *e.g.* Entebbe, they do not cause so much damage.

Iris. *I. germanica* does not flower very freely near Kampala ; the usual 'Iris' in gardens is *Moraea iridioides*, which is of easy culture in most places.

Lilium. The only common Lilies in Uganda are *L. longiflorum* var. *Harrisii*, which flowers well and increases in most places, and *L. candidum*, which grows well in Toro and Kigezi. *L. regale* has flowered at Entebbe, and should prove a beautiful garden plant, not too exacting in its requirements.

Polianthes tuberosa. This will grow in most parts of Uganda in full sunshine, and produce an abundance of heavily scented flowers ; there is a double form, but this is not so robust nor so floriferous as the single one.

Musa. Bananas are too constant a feature of the landscape in Uganda to be valued as decorative plants, but

M. coccinea should be a pleasant feature in a moist shady corner. The native species with their broad glaucous leaves are also very striking when grown under shade.

Orchids. There are many beautiful terrestrial Orchids in Uganda, some of which, e.g. *Lissochilus* spp., have been grown successfully in gardens. The epiphytic species, however, are less noteworthy, although a few have beautiful flowers. And of introduced Orchids there are very few in Uganda, although there are many which should flourish. The only one which is common is *Epidendrum radicans*; this will grow in full sun, but its roots should be covered with leaf mould; and it will produce a succession of long spikes of bright cherry-pink flowers.

Ravenala madagascariensis. The Traveller's Palm is a well-known plant, and many large specimens may be seen; but as with the Musas, they are best in a sheltered position—the leaves are larger, and are less liable to be torn by the wind: exposed plants often look very shabby.

Strelitzia. Both *S. Reginae* and *S. Augusta* should flourish in Uganda, but up to the present they are seldom planted.

INDIGENOUS PLANTS

The flora of Uganda is exceedingly rich, for owing to the geographical position of the country, inside the borders there are found representatives of many floral zones—East African, West African, South African and European. In the Semliki valley there even occurs wild the Oil Palm of West Africa: on the tops of the mountains may be seen Violets, Heaths, and Anemones closely allied to those of Europe. To describe all those which possess potential garden value is impossible: only a few not mentioned in Chapter XII will be quoted. We too have our Cordias, our Erythrinas and our Spathodeas; and of others there may be cited *Baikea Eminii* (**Leguminosae**)—a slow-growing tree of neat compact habit, bearing large white flowers and velvety dark brown pods.

Dombeya spp. (**Sterculiaceae**). Besides *D. reticulata*, there are several decorative species in Uganda, including *D. mukole*, a small tree with white flowers : *D. marginata*, a white-flowered shrub, attaining a height of 10 feet : and *D. runsoroensis*, which becomes a medium-sized tree, bearing white flowers, shaded with pink.

Erythrina spp. (**Leguminosae**). In addition to the universal and beautiful ‘ Kirikiti ’ (*E. tomentosa*), the larger *E. Seretii* is worth planting. This tree, which is typical of riverine forests, is quick growing and shapely ; in December, when the leaves have fallen, it bears masses of orange-scarlet flowers.

Kibelia spp. (**Bignoniaceae**). *K. Moosa* and *K. aethiopica* are small trees with pendant racemes of dull reddish flowers, which are followed by the long pendant fruits from which the tree derives its name, ‘ Sausage Tree.’

Markhamia platycalyx (**Bignoniaceae**). ‘ Nsambya.’ A small erect tree with attractive foliage and bright yellow flowers : the long narrow flat fruits hang on the tree for a long time and make it look untidy. Its decorative value is often overlooked, as it is so very commonly planted to supply poles, for which purpose it coppices well.

Milletia caffra (**Leguminosae**). Similar to *M. oblata*, and of equal value.

Monodora myristica (**Anonaceae**). A medium-sized tree, found in the moist forests : habit rounded, and with attractive dark foliage and striking flowers, 3 inches across, with large recurved sepals, yellow, blotched with red : fruits large, ovoid, containing aromatic seeds—hence called ‘ Calabash Nutmeg.’

Stereospermum Kunthianum (**Bignoniaceae**). A small tree, common in the Eastern Province, with attractive pink flowers.

A great many of the native trees are beautiful in habit and foliage, especially when fully grown : lucky is the gardener who finds ready formed a specimen tree such as the towering ‘ Kirundu ’ (*Antiaris usambarensis*), a spreading ‘ Mwafu ’ (*Canarium Schweinfurthii*), a majestic ‘ Mpewere ’ (*Piptadenia africana*) or a stately ‘ Mvule ’

(*Chlorophora excelsa*). Some of the smaller denser trees give grateful shade, such trees as ‘Muziru’ (*Pseudospondias microcarpa*), ‘Mutongana’ (*Carapa grandiflora*) or ‘Musali’ (*Garcinia Buchananii*).

Such trees are slow growing, and for the average impatient gardener there may be mentioned some which grow quickly but are of less beauty :—

Ficus sp. (**Moraceae**), ‘Mutuba.’ Abundantly planted by natives to provide bark for cloth making, but not often used in gardens. It is a quick-growing tree, with a natural spreading habit, and attractive glossy leaves : it is easily propagated by planting large poles : it does not unduly rob any plants in its vicinity : but it is too common to be appreciated.

Maesopsis Eminii (**Rhamnaceae**), ‘Musizi.’ A large tree, of very rapid growth : erect, fairly spreading, with small leaves, not casting a dense shade.

Musanga Smithii (**Moraceae**), ‘Umbrella Tree.’ Unique in its geometrical habit—a straight trunk, and successive whorls of branches forming a rounded regular head : leaves large, palmately divided.

A large proportion of the shrubs listed in Chapter XII are also wild in Uganda, and require no further mention : among our other beautiful shrubs are :—

Combretum spp. (**Combretaceae**). In addition to *C. abbreviatum*, there is the somewhat similar *C. paniculatum*, often seen in Toro : and *C. racemosum*, which in addition to the flowers has conspicuous bracts, sometimes white, sometimes chalky-pink, sometimes crimson ; the latter species also is a strong-growing woody climber.

Gardenia spp. (**Rubiaceae**). Two other species may be mentioned which occur in Uganda—*G. Jovis-tonantis*, a shrub, up to 20 feet in height, with tubular white flowers 4 inches long ; and *G. viscidissima*, a small tree, found on the Sese Islands, bearing sweet-scented flowers, white inside and red outside, about 6 inches long.

Mussaenda spp. (**Rubiaceae**). There are three species which are very attractive, and all of them are found in the moister forest zones :—*M. arcuata*, a scandent shrub with pretty yellow and brown flowers : *M. erythrophylla*, a woody climber, the flowers rendered striking by their large crimson bracts (really enlarged calyx lobes) : and *M. luteola*, an erect shrub, with creamy-yellow bracts.

Pandanus spp. (**Pandanaceae**), ‘Screw Pines.’ These occur in some of the wetter forests, and because of their striking habit are worth growing in large gardens.

Whitfieldia elongata (**Acanthaceae**). An erect shrub, height 6 feet, with dark foliage, and short spikes of white flowers.

Most of the herbaceous, bulbous and succulent plants and ferns native to Kenya occur in Uganda also, although we have fewer representatives of some genera, e.g. *Stapelia* and *Kalanchoe.* In addition to the plants listed, there might be mentioned a few others, such as *Polygala Elliotii*, a striking giant Milkwort in Kigezi, growing 4 feet high, with bright magenta-purple flowers : *Aeolanthus heliotropioides*, a common fleshy creeper on rocks, with mauve flowers : and some of the quaint small xerophytic Euphorbia.

LAWNS

In most districts of Uganda, west of the Nile, lawns are a very pleasant feature of the gardens, and are comparatively easy to maintain : but in parts of the Eastern and Northern Provinces it is difficult to keep grass in good condition.

To obtain a good lawn, it is essential that the ground should be well prepared—deeply dug, well levelled, and weeded : in order to carry out these operations, one must be patient. It is natural that one should be anxious to see the ground covered with grass, but it must be remembered that when this has been accomplished, it is no longer a simple matter to level or to weed the lawn.

Therefore prepare the site as early as possible, and do not plant it until rain has fallen on it for a few times, for the rain will cause the ground to settle, and it may need re-levelling, and it certainly will start the weed seeds to germinate—one or two hoeings will save a lot of trouble in hand-weeding later.

When the grass is planted, it must be put in firmly, and if no rain falls within twenty-four hours, it is advisable to water by hand, for once the grass has dried, it will be very slow in starting into growth.

After-treatment consists in cutting, rolling (which often is neglected), weeding and manuring. For the latter purpose, the application of sulphate of ammonia has proved to be of much more value than any method of top dressing; at first the whole of the herbage may be burnt brown, but soon the grasses, and especially some of the better grasses, e.g. *Cynodon dactylon*, will grow rapidly because of the additional nitrogen, while most of the weeds will have been killed. It is better to mix the sulphate of ammonia with ten times its weight of sand, and to apply the mixture at the rate of 3 oz. per square yard.

The ideal lawn grass for Uganda has yet to be discovered, but the following species are of value:—

Axonopus compressus. A native grass found near the lake shore, especially on the Sese Islands; is extensively used as a lawn grass in many tropical countries, and on wet soils in Uganda forms a thick bright-green turf.

Brachiaria decumbens, 'Kifuta.' A native grass, found in dry grassland; forms a thick coarse turf, and should be useful on poor soils.

Chloris pycnothrix, 'Kasibante,' forms a short, but not thick, greyish turf on poor soils; it is raised from seed.

Cynodon dactylon, 'French Grass.' This is easily propagated, and soon makes a thick lawn; but after a year or two it tends to die out and to be replaced by coarser grasses and weeds. It would seem probable that the death of the grass is due to nitrogen deficiency, and that is why it so quickly responds to fertilisation with sulphate of ammonia.

Cynodon transvaalensis, 'Masindi Grass.' This grass, in spite of its fine leaves and dwarf habit, is quite a fast grower, and soon covers the ground. The dwarf habit is somewhat of a drawback, because the grass is never rampant, so that sometimes it is not cut and becomes tufted, and after about two years tends to die out in unsightly patches. But if it is planted on firm ground, and kept short, it ought to last much longer.

Eragrostis Mildbraedii, a native grass, found in moist pastures, often comes into lawns ; it looks well, but the stems are so tough that no machine will touch them, and in consequence it has to be cut by hand.

Pennisetum clandestinum, 'Kikuyu Grass,' is little used for lawns in Uganda, except in Kigezi, but is worthy of trial in other cool parts, for example, Toro.

HEDGES

As with lawns, so with hedges—do not be in too much of a hurry, but prepare the ground thoroughly before planting ; a gappy hedge is an abomination, but it is the usual corollary to the presence of ill-dug soil or of the grass 'Lumbugu' (*Digitaria scalarum*). And if it is desired to keep a hedge in good condition, it is essential that it should be pruned to be somewhat narrower at the top than at the bottom, otherwise the lower branches will tend to become weak, and eventually to die—a process which will be hastened by the attentions of native labour, which prefers to cut hardest where the growth is weakest.

Almost all the plants mentioned in Chapter XIII may be used in Uganda ; of the species of *Cupressus*, in many parts *C. lusitanica* has been found most satisfactory. Flowering hedges are attractive sometimes, but often prove to be unsatisfactory backgrounds for the flowers inside the garden. Hedges of yellow Crotons or pinkish Acalyphas are apt to be very wearisome, and, in fact, as a rule, it is safer to plant only green-leaved plants.

Other plants of value for hedges in Uganda include :—

Bixa Orellana, 'Anatto.' Forms large thick hedges, but may be kept cut back to a height of 4 feet ; stands drought well, and is one of the best hedging plants for use on shallow soils ; grown from seed.

Cassia bicapsularis. A naturalised shrub, which will form a low bright-green hedge and will withstand drought.

Cassia siamea. A quick-growing tree, very useful for shelter belts, and may be pruned into hedges of any height from 4 feet to 10 feet. In the hotter parts of the country it suffers badly from gummosis, and in consequence is liable to die off in a few years.

Dracaena ugandensis. A native erect shrub which makes narrow erect hedges, up to 10 feet in height ; for such a hedge this is preferable to the Panax, which is so frequently used.

Eugenia uniflora, ‘ Pitanga Cherry.’ This is rather slow growing, but it may be clipped into a very neat dwarf hedge, with pleasant glossy dark foliage.

FOLIAGE TREES

Several species of Araucaria may be grown, but none of them flourish exceedingly ; many of the *Cupressus* spp. form good trees, and so does *Widdringtonia Whytei*, but owing to the luxuriance of the native vegetation in Uganda, coniferous trees do not fit into the landscape so well as they do in many parts of Kenya.

The feathery-leaved Leguminous trees seem more at home, and the various Acacias, Albizzias and Parkias are very effective. *Enterolobium Saman* grows well ; *Schinus molle* makes a beautiful specimen tree ; *Castanospermum australe* forms a large spreading tree, with dark pinnate leaves, and is a useful shade tree.

Palms. Some of the native species are worth inclusion in large gardens—*Phoenix reclinata* (Lukindu) with its dark glossy leaves ; the tall *Borassus flabellifer* var. *aethiopicus*—but it is slow growing at first ; *Raphia monbuttorum*, although its greyish leaves are so large that it requires a lot of space ; and *Elaeis guineensis* (Oil Palm), which apart from its economic value, is quite decorative by virtue of its crown of dark foliage.

A certain number of introduced Palms are grown, but these comprise only a tithe of those which should be of value ; there may be seen specimens of :—

Areca Catechu and *A. concinna.* Tall slender Palms, with pinnate leaves ; they are best planted in groups, for when isolated they are apt to look spindly.

Caryota urens. An erect Palm, attaining a height of 50 feet, with large bipinnate leaves and pendulous inflorescences ; it is striking in habit, but rather dingy in colour.

Chrysalidocarpus lutescens. The specimens are not fully grown, but the yellow-green leaves are attractive.

Ptychosperma Macarthuri forms a group of slender stems, about 10 feet in height ; leaves pinnate ; the small scarlet fruits are abundantly produced.

Oreodoxa regia, a handsome Palm with an erect smooth trunk, and long pinnate leaves ; the taller and more slender *O. oleracea* also should grow well.

VEGETABLES

The culture of temperate vegetables in Uganda is more difficult than in Kenya ; during the dry season in the Eastern Province it is almost impossible to grow many kinds. But if the instructions in Chapter XIV are followed, good vegetables could be produced in many places, and a wide variety could be obtained ; a few sorts, such as Broad Beans and Parsnips, are satisfactory only in cool districts.

More attention, however, might be paid to tropical vegetables, for when they are well prepared, as in the West Indies, some of them are very pleasant. Lima Beans (*Phaseolus lunatus*), Chocho (*Sechium edule*), Egg Plants (*Solanum Melongena*) and Okra (*Hibiscus esculentus*) all flourish in Uganda ; and some varieties of Yams (*Dioscorea* spp.) and Sweet Potatoes (*Ipomoea Batatas*) are quite well flavoured.

FRUITS

Very many kinds of fruit are grown in Uganda, and it is probable that others, not yet tested, would be of value in the country. The more important fruits already grown may be divided into three groups :—

A. *Those which are useful in most places.*

Avocado Pear (*Persea gratissima*), grows rapidly and fruits heavily.

Bananas. *Musa* spp. These are so common in most parts of the country that they are seldom planted in gardens.

Cape Gooseberry (*Physalis peruviana*). A sub-shrub, quickly growing and fruiting from seed.

Citrus fruits flourish, and have a good flavour, although owing to the small number of budded trees planted, there is a regrettable shortage of good Grape Fruit.

Guavas (*Psidium* spp.). Of these the Common Guava (*P. Guajava*), a medium-sized tree, and the Cherry Guava (*P. Cattleianum*) are the most useful.

Mango (*Mangifera indica*). Most of the trees are seedling forms with small fruits, but even these, when stewed green, make a good substitute for apples.

Mulberry (*Morus alba*). Easily propagated by cuttings, quick growing, and bearing a quantity of large red-black fruits.

Passion Fruit (*Passiflora edulis, P. quadrangularis*). Both species are quick-growing climbers, and fruit abundantly ; most people prefer the flavour of the former.

Pawpaw (*Carica Papaya*). Easily grown from seed, and should be transplanted when very young, only a few inches high.

Pineapple (*Ananas sativus*), stands drought well.

Raspberry (*Rubus* spp., *R. jamaicensis*). Sub-shrubby, spreading, height about 2 feet ; flowers white, fruits acid, bright red ; a useful little plant, preferring moist soil and light shade.

B. *Those which grow and fruit well, but are not of much practical importance, comprising :—*

Aberia Gardneri. Ceylon Gooseberry. Forms a large spreading shrub, bearing small, dark purple, very acid fruits.

Anacardium occidentale. Cashew Nut. A spreading small tree, with large leaves; fruits well, but the Nuts are smaller than those produced at sea-level.

Anona spp. Of these, the Sour-Sop, *Anona muricata*, is the most constant in fruiting; but the Cherimoya, *A. Cherimola*, and the Sweet-Sop, *A. squamosa*, both produce a certain amount of fruit.

Artocarpus integrifolia. Jack fruit. Grows into quite handsome trees, but few people like the fruit.

A. incisa, the Bread Fruit, is not so prolific or so robust in growth.

Averrhoa Carambola. Carambola. An attractive small tree producing an abundance of yellow angular fruits about 5 inches long, in flavour somewhat resembling Gooseberries; it should be planted more frequently.

Cocos nucifera. Coconut. This will grow and fruit quite well in the warmer parts of Uganda.

Diospyros Kaki. Persimmon. At Kampala this is slow in growth, but it fruits quite freely.

Eriobotrya japonica. Loquat. A small erect decorative tree, growing well and quite prolific; but good fruits are seldom seen in Uganda, as the trees are seedlings of a rather poor type, and the fruits are often spoilt by Fruit Moths.

Eugenia spp. *E. Jambos*, the Rose Apple, and *E. Jambolana*, the Java Plum. Both grow well and form trees well worth inclusion in gardens because of their decorative value, although their fruits are worth little. *E. uniflora*, the Pitanga Cherry, is a large shrub, pleasant in foliage and bearing quantities of small scarlet fruits, useful in fruit salads. Other species, including *E. malaccensis* and *E. floribunda*, are growing well, but have not yet fruited.

Phyllanthus distichus and *P. Emblica.* Both grow strongly and are very prolific.

C. *Those which require special care in most places and are more likely to succeed in the higher parts.*

Apples (*Pyrus Malus*).
Pears (*Pyrus communis*).

Plums (*Prunus domestica*).

Peaches (*Prunus persica*). It is probable that certain varieties could be found to be worth cultivation in many places west of the Nile, for good peaches are being grown in Kampala.

Grapes (*Vitis vinifera*). These are worthy of more extended trial ; even in Kampala there are prolific vines.

Strawberries (*Fragaria* spp.) fruit abundantly in the cooler parts, and are quite good when grown in moist soil at lower elevations.

PESTS AND DISEASES

In spite of the well-distributed rainfall, the atmospheric humidity in Uganda is usually fairly low, and therefore fungus diseases are not very prevalent ; when they occur, the treatments recommended in Chapter XIX may be used.

Insect attacks are usually spasmodic, but may be severe, and a constant watch should be kept for Caterpillars—no garden boy appears to be able to see them until the plants are completely defoliated ; the Caterpillar that feeds on the leaves of Amaryllis, Zephyranthes, etc., is one of the most prevalent. Fruit Moths are a great pest and at times may spoil a large proportion of the crop of Citrus fruits : the Chafer Beetle that eats the buds of Rose trees causes much annoyance. And, of course, as in most parts of the tropics, White Ants are liable to make short work of any woody plant that is not in good health.

There are not many gardens in Uganda which suffer much from raiding by Buck ; Squirrels and Monkeys, however, do cause damage to a considerable extent. And at Jinja and Entebbe, the Hippopotami from the lake are quite major pests ; a few years ago two hippos fought to death in the nursery at the Botanic Gardens, Entebbe ; the one that was unlucky expired on a bed of seedlings—the seedlings were unlucky too.

CHAPTER XIX

INSECT PESTS OF THE GARDEN

Introduction—Classification—Indirect Methods of Control—Mechanical Control — Chemical Control — Insecticide — Formulae — Biological Control—Ants.

Agricultural development in Kenya has been comparatively rapid, with a correspondingly rapid disturbance of natural conditions. Thousands of acres have been brought under cultivation from a previously virgin state, within a comparatively short time, and the natural checks having been temporarily or partially withdrawn, injurious insects have increased to such an extent as to become serious pests. In other words, insects which previously existed on the natural vegetation of the Colony have quickly responded to the disturbance of the natural balance, and, provided with large acreages of suitable and easily available food, have become of economic importance.

These injurious insect species are numbered by hundreds, and many are distributed over practically the whole of the Colony ; others are extremely local ; some are so severe that during certain seasons the damage they do is enormous ; some confine their attention to a few plants only, while others attack only one kind of plant.

Further, following colonisation, and especially during the last twenty years, thousands of packages of agricultural seeds, flower and vegetable seeds, fruit-trees, ornamental trees and shrubs, and other plants have been imported with the possibility of the introduction of pests from other countries. Luckily, we have very few introduced pests, and the permit and the inspection system in vogue is designed to prevent such introduction or to delay it as long as possible.

Again, the warfare against destructive insects is not ended when the crop is harvested; stored products of all kinds are liable to insect attack and to have both bulk and value seriously depreciated.

Farmers, planters, fruit-growers, nurserymen and gardeners now appreciate that to raise paying crops they must be prepared to protect themselves from loss caused by insects.

In the garden, vegetables are subject to the ravages of insects from the time the seed is planted until the edible portions are ripe for cooking; flowers and fruits are likewise subject to attack.

The progressive gardener and fruit-grower should, on account of the variety of pests, be in possession of information with regard to each. He should also have an intelligent understanding of the insects themselves, their mode of life and method of attack, so that this knowledge may be utilised for the prevention or mitigation of plant injury.

Space, however, does not permit of such detail, and the insects of the garden will be discussed here in more general terms. The injurious insects of the garden may, from their habits and method of attack, be grouped as follows:—

1. Insects which feed externally on any part of the plant, *e.g.* leaf-eaters, flower-eaters, root-eaters.
2. Insects which feed internally on any part of the plant, *e.g.* leaf-miners tuber-miners, stem-borers, fruit-borers, seed-borers.
3. Insects which suck the sap from any part of the plant, *e.g.* bugs, scale insects, ‘green fly.’
4. Insects which feed on other insects, either as predators, *i.e.* those which attack their prey externally and require a number of victims to feed them, or as parasites, which complete their development within the body of a single host.

With such a variety of widely different habits to contend with, it is evident that there can be no one general remedy or method of control to meet the case of all insect pests in the garden. Special cases require special treatment; but in all instances it is necessary first to know what insect is really responsible for the damage, and specimens should be sent for identification to the Senior Entomologist, Scott Agricultural Laboratories, P.O. Box 338, Nairobi.

As a rule, in textbooks, the control of insects is treated under the following heads :—

1. Indirect Methods.
2. Direct Methods—Mechanical.
3. Direct Methods—Chemical.
4. Biological Control.

1. INDIRECT METHODS

(a) Cultivation. The object of cultivation is to produce vigorous plants, and aims rather at the checking of any undue increase of pests than dealing with these when they are doing damage.

It is generally accepted that strong healthy, vigorously growing plants are more able to withstand the attacks of insects and, conversely, that the unfit suffer most or have their produce reduced to a much greater extent; soil preparation, therefore, is essential to maintain the plant in a vigorous growing condition from the start.

When it is remembered that over 90 per cent. of insects spend at least part of their lives in the soil, cultivation should be such as to render the conditions, during the soil period, as unfavourable as possible. Good cultivation crushes many insects and will help to expose adults, larvae and pupae, which rest in the surface soil, to the sun and to birds and other enemies, or will bury them to such an extent that they cannot regain the surface.

(b) Clean Cultivation. By clean cultivation is usually meant the destruction of all weeds and wild plants from the garden or orchard and their adjoining areas. The term ‘ weed ’ is usually applied to any plant which is neither ornamental nor useful, but in a garden any plant which is out of its proper place is a weed.

The indictment against weeds is that (1) they take up the space required for other plants, (2) they rob the cultivated plants of water, food, light and air, (3) they hinder cultivation, (4) they, in many cases, act as hosts to pests which later on will attack the cultivated plants. It is an old saying that ‘ one year’s seeding is seven years’ weeding,’ and that the evil that weeds do lives after them.

On the other hand, the advisability of absolutely clean cultivation is open to question, especially in the Tropics, because it is probable that the destruction of humus by oxidation, and the consequent effect on the soil texture, is more harmful than a crop of weeds. In the garden and orchard, however, this can be overcome by mulching or the growth of cover crops.

(c) **Fertilisers.** An insecticidal value has been claimed for certain artificials, but it seems more probable that the benefits accruing are due more to the increased vigour and consequent greater resistance of the plant to pests. In some cases the use of an artificial may produce a forcing of the plant and the production of a soft sappy growth, which, as a rule, is more susceptible to damage by pests.

(d) **Destruction of Crop Remnants.** The practice of leaving crop refuse lying about in the orchard, vegetable or flower garden is to be deprecated, as these accumulations of rubbish may continue the life-cycle of a pest or afford it a hiding or nesting place from which it will emerge to do further damage. All fallen fruit, diseased plants or parts of plants, prunings, etc., should be promptly burned, or buried deeply, the value of those lost to the soil being more than compensated for by the check on the spread of pests. Fruit-flies usually thrust their eggs into unripe fruits, and from the eggs hatch white maggots which tunnel into the pulp and render the fruit worthless. The fruits so attacked include peaches, guavas, citrus, and more especially pumpkins, marrows, squashes and melons, which may become nothing but a crawling mass of maggots. The obvious course is to collect and destroy all attacked fruit as soon as the attack is noticed. Rotting fruit and wind-fallen fruit should be burned or buried at least 2 feet under ground, so that the breeding of the flies may be prevented as far as possible.

(e) **Fallowing.** By a fallow is meant the resting of the land for a period between two consecutive plantings, not necessarily implying that no crop whatever is grown.

A clean or bare fallow is one in which the piece of land is kept clear of all vegetation for a certain length of time; the idea being that from the lack of food and the repeated cultivations necessary to ensure this, the insect population will be reduced to a minimum. As has already been stated, the value of this, in the Colony, is open to grave doubts on account of its destructive effects on the humus.

Secondly, after the crop is harvested, the land may be left to grow weeds of all sorts, and is not cultivated in any way until it is finally prepared for planting. This is not to be recommended, except in very special circumstances, because it is simply maintaining an uncontrolled breeding-ground for insects, some at least of which are potential pests.

Thirdly, also with a view to improving the soil, a crop, leguminous or otherwise, on which the insects which were originally the cause of trouble are not known to feed, may be grown and dug in at the proper time.

2. DIRECT METHODS—MECHANICAL

(a) **Hand-Picking.** The collection of pests by hand is of great value where this can be done before they have increased greatly in numbers, being much less expensive than spraying or dusting.

Conspicuous caterpillars, such as those of the hawk moth, the orange tree butterfly, semiloopers on tomatoes, etc., can be collected by hand and either crushed, burned or otherwise destroyed. The garden-boy can be provided with a tin containing water, with some oil on the surface, into which he can drop any bugs he may find.

Egg masses can likewise be collected and destroyed.

(b) **Trapping.** It is a well-known fact that some insects are attracted to light and, at different times, light-traps have been recommended for the capture of injurious insects. The simplest form of such a trap is an ordinary hurricane lantern hung over a tin or basin containing water with a film of oil on the surface. The insects, attracted by the light, fall into the liquid and are destroyed. It is very doubtful, however, if such light-traps are of any considerable importance as a means of control. It not infrequently happens that many more beneficial forms are trapped than injurious forms. It has also been noted, in attempts to control cutworms in this manner, that more males are attracted than females, and that a large proportion of the females, when attracted, have already deposited all or most of their eggs.

Small heaps of rubbish, flattish stones, or any such loose cover, scattered throughout the garden or orchard, will attract many night-feeding forms as a hiding-place during the day. Many cutworms, Gonocephalum, and flower and leaf-eating beetles can in this way be collected.

For army-worms and other caterpillars which travel, a trench 2 feet wide and about 18 inches deep, having the side next to the garden as nearly perpendicular as possible, will catch thousands of the caterpillars, which may be destroyed by dragging a roundish log along the trench or covering the bottom of the trench with dry grass and firing it. Such a trench, not necessarily so deep or so wide, is a protection to seed-beds and nurseries.

Trapping devices of any sort are undoubtedly of great value, but should be considered as supplementary to other control methods.

(c) **Pruning.** It is recognised that good pruning has a very markedly beneficial effect on the vigour of fruit-trees and on the quality and quantity of the fruit; it also has an important bearing on pest control.

Great care should be taken with all prunings which are infested with scale insects of any kind. If these are collected into bundles and carried through the orchard, brushing against bushes on the way, there is a risk of spreading the scales. In the case of mealy-bug it would appear to be better to leave the prunings on the ground until thoroughly dry. Few, if any, of the insects could regain the trees, and any beneficial ladybirds present would not be destroyed. As a general rule all prunings should be burned or buried deeply.

(d) **Screening.** The screening with cheese-cloth or fine wire gauze is sometimes necessary with choice vegetables and fruits, melons, and cucumbers, to keep off leaf-eaters and fruit-flies. This is obvious and simple.

(e) **Tree Injections.** Claim is occasionally made of the efficacy in pest control, of substances or compounds inoculated into fruit-trees. Wonderful results have been claimed, *e.g.* ‘ the method is simplicity itself, the trees or plants are not injured in the slightest, and any reasonable quantity of a substance as described can be inoculated in half a minute.’

The idea is that the insecticide inoculated, being of a poisonous nature, forms a poisonous sap, which means that the whole tree or plant is poisonous at all points, above and below ground, and destroys all manner of insects feeding on it. Such is the claim, but, as far as we know at present, such treatments are entirely without merit in pest control and can be decidedly injurious to the plant so treated.

3. DIRECT METHODS—CHEMICAL

Insecticides, as the name implies, are substances employed to kill insects, and the toxic action of the chemical used will depend on whether it enters the insect through the cuticle, by way of the breathing apparatus, or by the alimentary canal.

Insecticides can therefore be conveniently grouped as follows :—

Stomach Poisons.
Contact Poisons.
Fumigants.

Stomach poisons are substances which, when dusted or sprayed on to the leaves or stems of plants, are eaten by the insect, pass into the alimentary canal, and cause death. They are therefore used against biting or chewing insects.

For insects which suck the juices from the tissues, a poison sprayed on to the leaves would have no effect, as it could not be taken into the stomach in sufficient quantity to cause death; there are a few exceptions. Contact sprays are applied, therefore, so that by coming directly into contact with the insect they may cause death either by penetrating the cuticle, closing the breathing apparatus, thereby causing suffocation, or by action on the nervous system.

Both biting and sucking insects often occur where it is not possible to reach them by sprays or dusts, and fumigating, or poisoning the air they breathe, is resorted to.

The use of insecticides, in one form or other, has become a very important factor in the growing of crops, more especially in the plantation, in the vegetable garden, and in horticulture. Many of these can be home made, but it is often cheaper to buy preparations which only require dilution before use.

Here are given some of the more important insecticides, with notes on their preparation and use. It must be remembered, however, that it is not possible to give quantities which will be applicable in all cases, although the quantities given will be found suitable for ordinary work in the Colony. There is no benefit to be gained by changing these to any great extent, because a weaker mixture may not do what is required and a stronger mixture may be merely waste of material. If it is found that the mixture is too weak for the particular insect to be dealt with, a little more of the active agent may be added, bearing in mind the possible damage to the plant.

INSECTICIDES FOR BITING AND CHEWING INSECTS

Paris Green

Formula 1

Paris Green	1 lb.
Lime	4–5 lb.
Water	100–200 gallons

For small quantities use :—

Paris Green	1½ teaspoonfuls
Lime	½ oz.
Water	1 gallon

First slake the lime in 2 or 3 gallons of water, and dilute to the desired strength. Mix the Paris Green into a paste with a little water and stir into the lime water. One pound of Paris Green to 150 gallons of water is a good strength for several purposes. Stronger mixtures can be used for vigorous foliage and weaker for tender foliage. The spray should be strained before use to avoid clogging the nozzles of the sprayer, and should be kept constantly stirred to prevent settling.

One pound to 100 gallons is usually quite safe for application to the apple, cherry, cabbage, beets, potatoes, and most other trees and plants in the dry atmosphere of Kenya. On the peach, apricot, nectarine and beans, it is safer to use 1 lb. to 200 gallons of water.

The advantages of Paris Green are that little preparation is required and that it contains a high percentage of arsenic. Its disadvantages are that it is expensive, is liable to adulteration, does not adhere well to foliage, is liable to scorch, and, as it is insoluble in water, requires constant agitation in the sprayer.

Paris Green can be used as a dust if mixed with three or four times (or more) its weight of air-slaked lime. The lime and Paris Green are thoroughly powdered, mixed, and dusted on to the plants in the evening or early morning by means of a muslin bag, a blower or a duster.

The following formula is suitable for this method of application.

Formula 2

Paris Green . . .	1–2 oz.
Air-slaked lime or flour .	1 lb.

For some insects, notably *Gonocephalum* (flat earth-coloured beetle) and grasshoppers, a Paris Green poison-bait made with bran has given excellent results. The bait is made as follows, and any quantity can be prepared if the same proportions are kept.

Formula 3

Bran	12 lb.
Paris Green . . .	¼ lb.

The bran is moistened with water to form a mash, which is wet but not sloppy. The Paris Green is dusted on and stirred in thoroughly until each flake of bran receives some of the poison. This bait is sprinkled thinly or broadcast thinly amongst affected plants, about 30 lb. being sufficient for 1 acre.

Arsenate of Lead

Commercial arsenate of lead is put on the market in two forms, as a *paste* and as a *powder* :—

(a) *Paste.* This contains enough water to keep it in a moist condition, which makes it more bulky to handle and to ship, as in every hundred pounds there are some forty pounds of water. It is claimed that the paste works up better in water and requires less agitation in the spray tank, and also sticks better to foliage.

(b) *Powder.* The powder can easily be worked into a paste before dilution. This is done by using a small quantity of water to begin with and mixing carefully. If this is done, the physical condition of the resulting spray will be just as good as that obtained from the paste. The powder will keep indefinitely, can be handled easily, and has a lower cost for carriage.

The advantages of lead arsenate are that it is not liable to injure foliage, is not easily washed off by rains, is conspicuous on foliage, and stays in a better state of suspension than Paris Green. On the other hand, it is slower in action, permitting insects to go on feeding for some time after taking the poison.

Formula 4

For general use against all chewing insects :—

Arsenate of lead (powder) .	2 lb.
Water	100 gallons

Formula 5

For very resistant insects :—

Arsenate of lead (powder) .	3–4 lb.
Water	100 gallons

Formula 6

For small quantities :—

Arsenate of lead (powder) .	3 teaspoons
Water	1 gallon

Mix the required amount of lead arsenate to a thin paste in a small amount of water, and add this to the remainder of water in the tank. See that the mixture is thoroughly agitated when spraying in order to keep the insoluble poison in proper suspension.

Sodium Fluoride

Formula 7

Sodium fluoride . .	6½ oz.
Water	2 gallons
Chopped prickly pear .	2 gallons

Practical directions for making this cutworm bait are given by Dr. Ripley as follows :—To two gallons of clean soft water add 6½ oz. of commercial sodium fluoride (95 per cent. pure approximately) and stir. Chop up an equal volume (2 gallons) of prickly pear into pieces the size of a thumb, using a sharp knife, butcher's cleaver, or similar instrument. The blocks should be clean cut and not crushed by using too dull a knife. Add the prickly pear to the solution and stir. Soak overnight, preferably stirring once or twice during the soaking. Drain through a coarse sack or some wire mesh. Spread the bait broadcast, using about 200 lb. to the acre, or drop a little round the plants. It should be used on the day on which it is made, since it will not remain attractive longer than two or three days, even when kept in the solution. It does not dry up too quickly to prevent its use on sunny days if necessary. The formula must be followed closely, since other strengths or proportions may repel the cutworms or fail to kill them. A second lot of prickly pear should not be soaked in the same solution.

Any cutworm bait is more effective when spread after the land has been clean of weeds for a few days and before the crop is up, than at any other time.

Contact Insecticides for Piercing and Sucking Insects

Lime Sulphur

In addition to being a valuable insecticide it is an efficient fungicide. Several brands are on the market, and all are concentrated solutions, free from sediment and all extra materials. These brands, though more expensive than home-made lime sulphur, are easy to handle and obviate all trouble of preparation and apparatus. The dilutions necessary for different purposes and uses are supplied by the makers.

Kerosene Emulsion

Formula 8

Soap . . .	½ lb., or soft soap 1 quart
Kerosene . . .	2 gallons
Water (soft) . .	1 gallon

Boil the soap in the water until all is dissolved. While boiling hot remove from the fire, add the kerosene, and churn the mixture thoroughly for about five minutes. This is best done by the use of a syringe or force pump, spraying the liquid back into itself. The result should be a smooth, creamy emulsion without any free oil. If properly made it will adhere to the surface of glass without any oiliness. It becomes when cool a thick jelly-like mass. This is the concentrated stock solution, and must be diluted before use.

For trees or plants in foliage dilute 1 part with 10 to 15 parts of water.

Linseed Oil Emulsion

Formula 9

Soap (hard) . .	1 lb., or soft soap 2 quarts
Linseed oil (raw) .	2 gallons
Water . . .	1 gallon

Entirely dissolve the soap in boiling water, remove from the fire and add the linseed oil. This is churned as described for Formula 8, and no free oil should separate on cooling. This is useful for scale insects on the bark of trees, but should not be used on foliage. One gallon of the stock solution is added to 10 to 15 gallons of water.

Miscible Oils

'Miscible' or 'soluble' oils are for the most part petroleum products so treated by the addition of vegetable oils and saponification with an alkali as to make them mix quite freely with water to form a milky-white spray fluid.

Manufacturers have placed on the market many different brands. These, though they vary somewhat in composition, give very much the same results. The best of them combine the insecticidal properties of the oil with a margin of safety for the plant. The directions given by the makers, either on the container or in a leaflet form, should in all cases be followed accurately. They have the disadvantage of costing more than home-made lime sulphur or emulsions, but have the distinct advantage of requiring no preparation and of being ready for immediate use. One which is largely used in Kenya is Orthol K.

Sunlight Soap

Formula 10

Sunlight soap . . .	1 cake
Water	2 gallons

The soap is dissolved in the water and used while still warm. The spray has given good results against Aphides and Thrips, and does not injure blossoms. It has the advantage of being cheap and easy to mix.

Nicotine

Nicotine, extracted from tobacco, as a solution is widely used as a contact spray for plant-lice and other sucking insects on verandah plants, garden plants and vegetables, as it does not injure the foliage and gives good results.

Tobacco extract may be easily prepared at home, but it is not easy to standardise owing to the variation in the nicotine content of the tobacco used. Two pounds of stems and leaves are soaked, with occasional stirrings, for twenty-four hours in 4 gallons of water. After straining to remove solid matter the spray is ready for use. In each gallon dissolve about one cubic inch of soap, as this helps to liberate the nicotine and acts as a spreader. The home-made extract should be used soon after preparation, as it will ferment in two or three days and be useless for spraying.

4. BIOLOGICAL CONTROL

Were it not for natural checks upon the increase of caterpillars, aphides, scale-insects and insect pests in general, there would be such an overwhelming increase of pests that it would be an almost hopeless task to try to grow crops of any kind.

The results which have been obtained in the breeding and dissemination of certain predators and parasites for the control of injurious forms, has led to a detailed study of procedure and methods. So many factors have to be taken into consideration that it is not possible to give here even a general account of the biological control of insect pests, and those interested are invited to visit the Entomological Laboratory.

ANTS

These insects are abundant in the Colony and, though in the main they are beneficial as they remove dead or dying insects and act as scavengers, frequently colonies of one kind or another take up their abode in gardens and prove a nuisance.

Some species are found in attendance on aphides and scale insects, from which they obtain the substance commonly called ‘ honeydew.’ The benefit is mutual, as the ants protect these insects from their enemies.

The species which make their nests in gardens may be killed comparatively easily by the use of carbon bisulphide.

If the nests are large, several holes are made, with a pointed stick, into the hills—for small nests this is not necessary—and about an egg-cup full of carbon bisulphide is poured into the hole. A basin, or some such thing, is inverted over the nest to conserve the fumes. The fumigation should be done in the middle of the day.

WHITE ANTS OR TERMITES

‘ White ants ’ are not true ants, but resemble these more or less superficially. They are social insects, living together in colonies which are made up of different forms or castes.

The workers attend to the construction of the nest, provide food for the queen, feed and care for the young, and generally do all the work of the colony.

The soldiers are generally regarded as a caste produced for protection.

At certain seasons enormous numbers of winged forms—

kings and queens—leave the nest, usually after a shower of rain. After flying for some time they alight, the wings are broken off, and each pair endeavours to start a new colony. Eventually the queen becomes a mere mass of eggs, helpless and unable to move.

In order to destroy the nest, it is a common practice to dig out the queen. This is not always successful in destroying the community, as in many instances the nest is re-established or several new nests are brought into existence.

Fumigation with carbon bisulphide has given good results, if carefully done. The top of the mound is broken until a distinct down gallery is exposed, when all other holes are plugged with clay or wet earth. A funnel or piece of piping is inserted into the down gallery, and from eight to twelve fluid ounces of carbon bisulphide poured in, according to the size of the nest. The filler is withdrawn and the hole plugged with wet earth. A modification of this method, by introducing a length of fuse into the hole and exploding the carbon bisulphide underground, is said to be more efficacious.

Another method is the pumping of arsenic and sulphur fumes into the nests. This is done by a special machine, commonly known as an ‘ ant pump ’ or ‘ ant destroyer.’ Instructions for use are supplied by the agents, the important points being that the correct mixture should be used, that the charcoal fire in the furnace should be burning well, and that the fumes should be pumped into a fairly large gallery. The fumes penetrate all galleries of the nest and kill the fungus gardens as well as the inhabitants, which leads to the gradual extermination of the whole colony.

CHAPTER XX

DISEASES OF GARDEN PLANTS

Introduction—The Nature of a Fungus—Virus Diseases—Non-Parasitic Diseases—Specific Plant Diseases—Potato—Tomato—Runner Beans—Peas—Cucumber—Vegetable Marrow—Celery—Asparagus—Beet—Strawberry—Rose—Carnation—Wilts—Root Knot—Fungicides.

Plants may be considered to be in a diseased condition when their normal life processes are interfered with detrimentally in any way. Diseases are not, therefore, necessarily due to a parasite, but may be brought about by non-parasitic agencies also.

It is customary to make a somewhat artificial distinction between plant pests and diseases, and to reserve the former term for insect parasites. Plant diseases, which alone will be dealt with in this chapter, principally include pathological conditions brought about by :—

(*a*) Parasites of the vegetable kingdom, chiefly fungi and bacteria ;
(*b*) infective viruses, the nature of which is still little understood ;
(*c*) non-parasitic causes, such as unsuitable soil or climatic conditions.

It frequently happens that the existence of unfavourable growing conditions predisposes the plant to attack by parasitic disease.

The Nature of a Fungus. The average layman finds the fungi which attack his plants much more mysterious than their insect enemies. This is doubtless because, while the latter are generally readily visible, a great deal of the former is hidden. In most cases, in fact, what the man in the street speaks of as a fungus (*e.g.* a mushroom or a toadstool) is only the fruiting body, and bears much the same relation to the whole fungus as, say, the tomato fruit bears to the whole tomato plant.

Both the higher plant and the fungus belong to the vegetable kingdom, but to opposite ends of it. Although they have little in common in general appearance, they possess nevertheless the same two stages in their life histories —namely, the vegetative stage, concerned with nutrition and growth, and the reproductive stage, which propagates the species.

Whereas the vast majority of higher plants start life by the germination of a seed, most fungi begin from the germination of a spore, a minute structure which differs considerably in size and form according to the species concerned, but is always too small to be visible to the naked eye. The result of germination is the production of a germ-tube. This soon starts to branch, and thus, by constant repetition of the process, gives rise to a network of fungus threads called a mycelium. This structure, which constistutes the vegetative phase of the fungus, is usually hidden in the substratum from which it is absorbing its food supplies. In the case of harmless, non-parasitic fungi of the mushroom type, the substratum may be fallen leaves or branches in a forest, or a manure or compost heap. But where the fungus is a parasite, such as those with which the gardener has to contend, the tissues of the diseased plant constitute the substratum, and the fungus threads ramify through and between the cells of the host, extracting food materials at the expense of the latter. Although a far from accurate comparison, it may assist the reader to picture the fungus amongst the cells of the host plant as similar, though on a minute scale, to the roots of a higher plant penetrating between the particles of soil. There is, however, one type of fungus, to which the mildews belong, in which the fungus threads are almost entirely superficial and may be seen in mass as the white growth on the surface of leaves of vegetable marrows, roses, and so forth.

After a period of vegetative growth, fungi, like the higher plants, reach the reproductive or fruiting stage. Beyond the fact that in each case the bodies produced fulfil the same function of propagating the species, it is difficult to find any kind of resemblance between them. Few of the parasitic fungi with which this chapter deals have fructifications of an easily demonstrable type like the mushroom. They are much more frequently minute bodies, often only just visible to the naked eye as, perhaps, black pin-points on a diseased leaf spot. Their variations in form are very great, and far too numerous to attempt to describe here; but they all have one feature in common, namely, the production of spores. These, when mature, become released from the surface of the host, and by means of wind, rain splashes or other agency, are disseminated as potential sources of new infection elsewhere. Just as flowering plants are not always dependent on seeds for their perpetuation, but in some cases may be vegetatively propagated by means of tubers or cuttings, so some fungi also may be spread by vegetative growths produced on the mycelium. An instance of this is seen in the sclerotia of the black scurf disease of potatoes to be mentioned later.

Bacteria are closely allied to fungi, and for present purposes may be regarded as fungi consisting of single cells. A few form spores within their bodies, but most multiply by the simple process of dividing into two, each half then increasing in size till it becomes as large as the original organism.

Virus Diseases. A considerable amount of knowledge concerning virus diseases has accumulated since they were first recognised, but no one yet knows of what their infective principle consists. It is not even known whether it contains living organisms or not, although perhaps the most popular theory is that it is composed of organisms too small to be seen under any microscope yet constructed.

In nature, virus diseases are commonly transferred from affected to healthy plants by means of insects, and in rare cases they may be transmitted by the rubbing of diseased foliage against that of neighbouring healthy plants. Many can be transmitted artificially by transferring sap from a diseased plant to a healthy one, or by grafting tissue from the former on to the latter or *vice versa.* Few viruses are transmitted from one generation to the next in true seed, but they are usually carried in cuttings, tubers or other vegetatively produced parts from affected plants.

Non-Parasitic Diseases. These may be due to one or more of a large number of factors. It is generally more difficult to decide the cause of them than of those where a definite parasite is present. Diagnosis of this type of disease frequently resolves itself into a kind of detective study, which examines the conditions under which the plants are growing and inquires into their past history. Too much or too little rain, wide variations in temperature, lack of soil nutrients, excessive soil acidity, depletion of humus, poor drainage or an exposed situation, are only some of the wide range of conditions which may bring about a state of ill-health in garden plants.

Specific Plant Diseases. It is impossible to do anything like full justice to the subject of garden diseases without writing a book about them. Within the limits of this chapter, therefore, it is not proposed to do more than describe briefly the chief signs of some of the principal maladies likely to be met with by Kenya gardeners, and to indicate equally briefly the preventive or remedial measures to be adopted. Notes on the preparation of the chief fungicides required for the control of certain diseases will be found at the end of the chapter.

I. VEGETABLE GARDEN DISEASES

A. POTATO

Powdery Scab (*Spongospora subterranea*). Tubers showing round to oval pustules, surrounded by a fringe of the broken skin and containing a brown powder, consisting of decayed tissues and the fruit bodies of the causal fungus. Usually not penetrating the flesh of the potato to any extent.

Control. Careful drainage and cultivation, long rotation, avoidance of manure contaminated with diseased potatoes, selection of clean seed and disinfection with hot corrosive sublimate or formaldehyde (see under Fungicides below). Application of lime favours this disease.

Black Scurf (*Corticium vagum*). Has two stages. The *Rhizoctonia* stage, that usually seen, consists of very superficial, small, black scabs on the tubers, well described as 'the dirt that won't wash off.' (These are the vegetative bodies mentioned in the introductory paragraphs.) In wet seasons or districts the young sprouts may be attacked by a brown rot, or a white mould may appear enveloping the stem base. The latter is the spore-bearing *Corticium* stage. Tubers produced below ground may be small. The disease is also often characterised by the production of aerial tubers on the stems.

Control. Seed selection for freedom from disease, seed treatment with corrosive sublimate as for powdery scab, crop rotation, use of lime unless powder scab is also present, avoidance of acid fertilisers.

Early Blight (*Alternaria solani*). Dark brown, dry, sharply defined spots, sometimes showing zoned appearance, on leaves. When severe, curling and drying up of leaves and defoliation. Yellowing of stalks.

Control. Plant vigorous seed ; cultivate well ; see that crop is well supplied with nourishment ; spray with 1 per cent. Bordeaux Mixture at about monthly intervals from the time that the plants are 6 inches tall.

Virus Diseases. Leaf-roll type. Leaves rigid, crisp, dry. Edges of leaflets rolled upwards and inwards, thus causing the leaflets eventually to assume a tubular form.

Mosaic type. Includes many sub-types such as crinkle, curly dwarf, and streak, which exhibit one or more of the following signs : leaflets mottled, wrinkled, distorted (instead of flat as in healthy plants), reduced in size ; angular spots on leaves running down veins into leaf-stalks and main stems (streak) ; plants dwarfed, maturing earlier than normally.

Accumulation of virus infection through insect carriers results in degeneration of the crop and decreased yields.

Control. Periodic introduction of fresh seed from countries, such as Scotland, which are comparatively free from virus diseases.

B. TOMATO

Leaf Spot (*Septoria lycopersici*). Circular spots up to a quarter of an inch in diameter, with dark brown margin and sunken grey centre. Similar, but elongated, spots on stems. Drying up and shedding of diseased leaves.

Control. Plant seed in good, new soil. Avoid weeding when plants are wet. In planting out, remove and burn diseased leaves. Spray with 1 per cent. Bordeaux Mixture at frequent intervals from seedling stage onwards. Burn all old plants and fallen leaves.

Blossom End Rot (Cause unknown). Sunken spot arising at blossom end of fruit (*i.e.* that remote from stem end), covered by dark coloured, leathery skin. The flesh sinks, causing flattening of the affected end. Has appearance of fungous disease, but cause now generally considered non-parasitic.

Control. Plant out well-hardened, stocky plants. Avoid rapid fluctuations in water supply. Do not use fresh boma manure or excessive quantities of fertilisers. Mulch the soil with grass or similar material.

Sunscorch (non-parasitic). Bleached areas with leathery skin on fruits.

Control. If prevalent, use varieties with dense foliage, maintain soil humus, and ensure adequate water supply in hot weather.

C. RUNNER BEANS

Bacterial Blight (Bacterial species not certain). Irregular brown or reddish-brown spots, up to about a quarter of an inch across, on leaves. Diseased tissue breaking away, leaving edges of leaves ragged and leaf blades with numerous holes. Considerable defoliation. Stems and leaf-stalks may be cankered. Pods show reddish-brown very irregular spots, possibly raised, but not sunken, in the middle. Often extending into seed within affected pods.

Control. Use seed collected from uninfected pods examined before harvesting. Ensure good drainage ; cultivate well but only when the plants are dry. Spraying is not wholly effective, and so many applications are required that it does not pay to treat with sprays. Eventual control will probably be by means of resistant varieties, but these have not yet been produced.

Anthracnose (*Colletotrichum lindemuthianum*). Almost round, *sunken* spots, up to nearly half an inch diameter, with dark, almost black centres, on the pods, are the most distinguishing feature. In moist weather, minute flesh-coloured gelatinous spore-masses may be visible in centre of spots. Infection may penetrate to the seeds. Black, slightly sunken spots on stems. Blackening of lower surface of leaf veins. Petioles of leaves also attacked and greatly weakened.

Control. As for Blight above.

Leaf Spot (*Isariopsis griseola*). Small angular spots without coloured borders. Grey, mouldy growth on under side of spots when the fungus is fruiting.

Control. Spray with 1 per cent. Bordeaux Mixture.

D. Peas

Powdery Mildew (*Erysiphe communis*). White mould on leaves, stems and pods. Foliage turning yellow and drying up.

Control. Spray with 1 per cent. Bordeaux Mixture or 1 : 40 Lime-Sulphur as soon as the disease appears.

E. Cucumber

Powdery Mildew (*Erysiphe cichoracearum*). White mould on leaves and stems eventually causing brown, dead spots. Yellowing of the vines. Reduction in size of fruits.

Control. Dust with Flowers of Sulphur.

F. VEGETABLE MARROW

Powdery Mildew (*Erysiphe cichoracearum*). As for E above.

G. CELERY

Septoria Blight (*Septoria apii*). Rather small brown spots, tending to be circular on leaves, elongated on stems. Small black points (fruiting stage of the fungus) visible on spots. Withering and drying up of foliage.

Control. Remove and burn all refuse. Spray with 1 per cent. Bordeaux Mixture, giving first two applications in seed-bed ; afterwards once a month during rainy weather. Wash stalks carefully after harvest.

H. ASPARAGUS

Rust (*Puccinia asparagi*). Reddish, rusty pustules on stems and needles, causing latter to fall off when severely infected.

Control. Plant in open, well-ventilated situation. Keep well supplied with water. Spraying with Bordeaux Mixture alone is reported to be not very effective in Kenya. In America a resin-fish oil sticker is recommended, but the latter ingredient is not obtainable locally at present. It might be found advantageous to use the resin-soda sticker or a casein spreader (see FUNGICIDES below). If spraying is carried out, make the first application three weeks after the cutting season and give two additional applications at about three weeks interval. Some control is obtainable by removal and destruction of affected foliage. Two varieties, 'Martha Washington' and 'Mary Washington,' which are resistant in America are believed not to be so in Kenya.

I. BEET

Leaf Spot (*Cercospora beticola*). Circular, brown to grey spots with ashen grey centres, becoming dry and brittle and often falling out, leaving ragged holes in the leaf tissue. Spots have purplish margin. Attacks outer, older leaves first.

Control. Destruction of dead leaves. Crop rotation. Seed treatment by dipping seed for seven minutes in Formaldehyde solution (15 parts per 1000 water), afterwards rinsing in water and planting while still wet or after drying. Spraying plants with 1 per cent. Bordeaux Mixture at fortnightly intervals from first appearance of disease.

J. STRAWBERRY

Leaf Spot (*Mycosphaerella fragariae*). Small circular spots with white or grey centres and purple to red horders on leaves. Also attacks fruit stems.

Control. Frequent change of beds, removal and destruction of diseased leaves, one or two early sprayings with 1 per cent. Bordeaux Mixture, repeated as soon as disease shows signs of making headway again. End of season cut and remove leaves, cover plants with straw or grass and burn.

II. FLOWER GARDEN DISEASES

A. ROSE

Mildew (*Sphaerotheca pannosa*). White, powdery patches on leaves and stems.

Control. Dust with Flowers of Sulphur or spray with Lime-Sulphur, 1 : 40.

Black Spot (*Diplocarpon* (*Actinomyces*) *rosae*). Brown to black irregularly-shaped, though fairly well-defined spots on upper surface of leaves. Areas outside actual spots turning yellow. Defoliation.

Control. Spray with 1 per cent. Bordeaux Mixture early in season to prevent disease obtaining hold near blossoming time. Remove and burn all dead material. If possible select cuttings from bushes showing resistance to the disease.

Crown Gall (*Pseudomonas tumefaciens*). Gall formation on stem at ground level.

Control. Carefully examine cuttings and plant out only those free from this disease. Avoid mechanical injury to stems.

B. Carnation

Rust (*Uromyces caryophyllinus*). Chocolate-brown, elongated pustules on stems and leaves.

Control. Take cuttings from healthy stock. Avoid wetting leaves during watering. If possible use sub-irrigation. Support leaves out of contact with moist soil. Plant wide apart to ensure good ventilation. Spray weekly with Bluestone solution, 1 lb. to 25 gallons of water.

Leaf Mould (*Heterosporium echinulatum*). Small, circular spots up to one-sixth of an inch in diameter, covered in concentric rings of dark mould.

Control. Watering and spacing as for Rust. Spray with 1 per cent. Bordeaux Mixture.

C. Miscellaneous Plant Diseases

Few other diseases of importance in flower gardens have been recorded in Kenya.

Wilts. Wilts of various plants occur occasionally. These are often due to soil-inhabiting fungi which have been presented with conditions favourable to attack. Such fungi usually occur in patches, and attack any susceptible plants growing in the infected area, invading the roots and thus, by cutting off the plants' water supply, causing them to yellow and die off.

Killing fungi in the soil is an expensive matter. Over very limited areas, watering with a solution of one part commercial Formalin (40 per cent. Formaldehyde) in fifty parts water, using about one gallon per square foot, will generally prove effective. The soil should be thoroughly wetted to a depth of one foot and should afterwards be covered with a tarpaulin or something of the sort to retain the fumes for two days. A week or ten days should then be allowed for the gas to escape before planting. In the case of very small areas, it will probably be easier to remove the soil completely and replace with new. The infected soil should not be scattered over unaffected land. If possible it should be thrown on to a fire. The implements used for its removal should also be disinfected by passing them through a fire.

Poor drainage conditions and excessive acidity are frequently associated with Wilt diseases, and should receive attention where necessary. The latter may be corrected by Liming.

ROOT KNOT

Eelworm (*Caconema radicicola*). This is not a vegetable parasite nor yet an insect. It is a nematode or round-worm almost microscopic in size, which attacks the roots of a large range of plants, including various wild hosts. It is particularly common on Potatoes and Tomatoes in Kenya, in the former case attacking the tubers as well as the roots.

Attack by the parasite causes yellowing, wilting and dwarfing of the above-ground parts, while extensive swellings occur on the roots. Rough, warty excrescences appear on the surface of attacked Potato tubers, and these, when cut across, show brown spots beneath the skin in which may be found minute, pearly structures which are the female worms.

Small areas may be rid of this pest by pouring boiling water at the rate of 7 gallons per cubic foot on to the soil. Otherwise crop rotation must be resorted to for at least two years. Here, however, the wide range of hosts of the nematode presents a big difficulty. Members of the grass family as a class are resistant. Maize, Sorghum (Mtama), etc., may therefore be grown with impunity on infected land. Ground-nuts are also safe. In exceptional cases, flooding the affected land for several months may be a possible means of destroying Eelworm. Affected Potato tubers should not, of course, be used as seed.

FUNGICIDES AND THEIR PREPARATION

One per cent. Bordeaux Mixture.

Copper sulphate (bluestone)	5 lb.
Hydrated lime (fresh) .	7 lb.
Water	50 gallons

Dissolve the bluestone in 5 gallons of the water in a wooden vessel. Mix the lime with the rest of the water (45 gallons) in a second wooden vessel, then pour the bluestone solution into the latter, stirring continuously. Use the same day.

Five lb. quicklime may be substituted for the hydrated lime above, but will require slaking by the addition of small quantities of water till bubbling ceases, before making up to 45 gallons. Agricultural lime (ground limestone) is useless for spray making.

Smaller quantities can, of course, be made by reducing the amounts of all the materials proportionately.

Lime-Sulphur. This fungicide can be home-made, but the method is complicated and the resultant product is so variable in concentration that the average horticulturist may be strongly advised to buy a good commercial brand of the concentrate, and to use it at the dilution indicated.

Sulphur. Flowers of sulphur or more finely-ground forms, such as ‘vine’ sulphur, obtainable in Nairobi. Simply dusted on the plants without admixture with other substances.

Formaldehyde (for seed potato treatment against scab and black scurf). One pint formaldehyde solution to 15 gallons of water. Immerse for five minutes at 46–50° C. (115–122° F.).

Mercuric Chloride (corrosive sublimate—for seed potato treatment against scab and black scurf). Four ounces mercuric chloride to 15 gallons water. Immerse for five minutes at 44–45° C. (111–113° F.). Dry thoroughly before planting.

Spreader or Sticker. Casein. Use a proprietary sticker according to the maker's directions. One such locally obtainable is Capex Universal Spreader.

Resin Soda.

Washing soda . . .	1 lb.
Resin	2 lb.
Water	1 gallon

Boil the water, then add the soda. When the latter has dissolved, add the resin and boil for an hour, stirring continuously. Use at the rate of 1 gallon to 24 gallons Bordeaux Mixture.

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